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CONFRONTI TRANS- E INTER-TEMPORALI DELLA POLITICA MONETARIA E IL FATTORE *K*

di
GIOVANNI DEMARIA *

Permettano le autorità e tutti i presenti che faccia un breve preambolo.

È sempre con vivissima simpatia che io ho guardato alla vostra città, una simpatia tutta fedeltà e spesso con nostalgia. Cioè, concretamente, e a distanza di circa un decennio l'uno dall'altro, a partire dal giugno 1917 quando vi giunsi recluta al 3° reggimento di artiglieria da campagna (allora Bologna era zona di guerra) ossia tre mesi prima che esso partisse per il fronte. Poi si susseguirono i miei incontri con Bologna. Dapprima la mia appassionata militanza nella scuola di Gustavo Del Vecchio, il grandissimo economista della vostra Università. Indi, ancora in altra piena guerra mondiale, la mia recensione a un famoso libro del vostro Ferruccio Pergolesi, acutissimo e audace costituzionalista. Una recensione che fu causa nel 1942 della soppressione del *Giornale degli Economisti*. In seguito, gli incarichi di insegnamento nei primi anni di vita della Johns Hopkins University, Bologna Center. Infine, le illuminanti discussioni con i vostri professori universitari: Federico Flora, Paolo Fortunati, Felice Vinci, Ernestro D'Albergo, Luigi Dal Pane, e con il vostro grande letterato Riccardo Bacchelli.

Questo il mio preambolo doveroso e anche la ragione fondamentale, perché legato da anni a questa illustre Accademia come suo membro corrispondente, del nostro incontro odierno su un tema definito solo recentemente che si riattacca a una relazione numerica fondamentale in Economia, quella della « parità dei poteri di acquisto » come misura del cambio estero di equilibrio. Cioè:

$$\frac{\Sigma pq}{\Sigma PQ} = K \frac{\bar{p}\bar{q}}{\bar{P}\bar{Q}}$$

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Discorso tenuto all'Accademia delle Scienze dell'Istituto di Bologna, il 15.6.1993.

dove a sinistra c'è il rapporto tra i prodotti di due vettori e a destra c'è il rapporto tra i prodotti delle medie temporali dei due vettori (o sottovettori se così distinti) relativi ai prezzi p e alle quantità q scambiate in un certo momento, da due paesi, quello considerato e quello estero (indicato in maiuscolo). Adottare la destra e far sì che K sia $= 1$ significherebbe costruire delle medie del tutto immaginarie e estremamente artificiose, senza alcuna connessione sistematica (dal lato della realtà economica riguardante il cambio estero). Questo sia al numeratore sia al denominatore della destra. Anche il confronto tra due quozienti sarebbe ancora più irrealistico (nel senso che sarà indicato successivamente).

Avverto che in questa relazione c'è il concetto di vettore « random », cioè con elementi a distribuzione probabilistica ignota ma a media *zero*. E così dicasi dei sottovettori nel caso che li si volesse tenere in conto. Dunque, il termine vettore non è nel senso tradizionale ma in quello proprio di una ricchissima letteratura statistica, soprattutto americana, la cosiddetta « multivariate analysis », ma con una varianza impossibile a prefigurarsi a priori, e perciò ipotetica (onde una molteplicità di autovalori ignoti nel caso la si volesse porre in termini di equazioni alle derivate parziali per almeno due argomenti).

Tuttavia, le Banche Centrali nella loro politica monetaria concernente il cambio estero considerano solo (o soprattutto) i rapporti tra saggi internazionali di interesse o tra altre entità economiche particolari, come il N.I. del fatturato (generale o per certi rami dell'industria nazionale) o come quelli indicati dalla seguente esemplificazione.

Esemplificazione di componenti di p *e* q

1. Saggi di interesse dei due paesi a confronto
2. M_2, M_0 (per controllare la moneta onde il monetarismo totale o solo manuale della circolazione) dei due paesi a confronto
3. Importazioni ed esportazioni per settori che contano
4. Salari nei due paesi
5. Cambi a termine (di riporto e deporto) nei due paesi
6. Disoccupazione nei due paesi
7. Investimenti nei due paesi
8. Risparmio (tassi di...) nei due paesi
9. Parti del prodotto nazionale nei due paesi
10. Parti del reddito nazionale nei due paesi
11. Tassazioni nei due paesi
12. Indici costo della vita nei due paesi

Dunque, queste componenti, considerate come vettori, sono con elementi aventi distribuzione casuale non prefigurata a priori. Inoltre, con questi aspetti limitati a pochi settori le correlazioni tra cambio estero e loro contenuto sono spesso incerte e discordanti. Comunque si tratta di correlazioni di breve periodo, cioè di un universo di osservazioni troppo limitato.

Meglio, molto meglio rifarsi all'insegnamento della parità dei poteri di acquisto come calcolata dai nostri padri economisti, ultimo il Cassel, e indicata dalla sinistra della relazione precedente. (Talvolta i confronti internazionali sono a base di differenziali di saggi di interesse, di salari, di rapporti tra indebitamento e PIL, ecc., ma anche questi sono solo delle espressioni « settoriali », dunque incomplete, dei rapporti dei poteri totali di acquisto, interni e esteri, e quindi del cambio estero).

La pratica internazionale degli ultimi 20 anni fino alla vigilia di Maastricht

Ciò premesso dal lato metodologico vediamo dal lato storico come in pratica si è cercato di dare base diversa da quella ora definita alla politica monetaria del cambio estero. Confronterò solo due aspetti accaduti verso i primi degli anni Settanta. Ciò consentirà di fare un passo verso la politica del cambio estero che dovrebbe imporsi nel 1994 e poi negli anni seguenti secondo gli accordi di Maastricht.

Com'è noto, verso i primi anni Settanta, sulla scena internazionale si era improvvisamente presentato, con urgenza, il massimo problema monetaria del mercato libero, quello del cambio *concordato* globalmente o quasi dalle Banche Centrali ma ben diverso dal Bretton Woods. È stato prima il presidente Nixon a sollevarlo in una atmosfera accaldata di Ferragosto. Poi, dallo stesso Fondo Monetario Internazionale che, quasi umilmente, chiese alle 118 nazioni membri del Fondo di collaborare per *stabilire soddisfacenti variazioni dei cambi esteri.* Circolarono perciò vari progetti di riorganizzazione del sistema monetario mondiale.

Il primo progetto fu quello dell'economista socialista ungaro-inglese Nicola Kaldor. Esso avanzava una vecchia storia. Invece che sull'oro le monete dovrebbero basarsi, negli scambi mondiali, su una moneta di conto calcolata disinteressatamente da un organismo internazionale al di sopra di ogni sospetto; una moneta ancorata quindi a un indice medio dei prezzi di una trentina di merci quotate sui maggiori mercati del mondo. Un progetto però non gradito dai paesi d'oltrecortina che non avevano mai avuto che disprezzo per tutto ciò che sapeva di Fondo Monetario Internazionale, anche perché sarebbe stato un eccellente motivo dell'apparizione di tanto in tanto

di rapidissimi allineamenti monetari (così necessari invece alle economie dello schieramento socialista).

Il *secondo progetto* di sistemazione del cambio estero nacque col nome del ministro Barber, cancelliere dello Scacchiere inglese, sebbene, probabilmente, fosse stato una creatura del direttore generale del Fondo Monetario Internazionale (cioè del dottor Schweitzer). « Ascendendo per li rami », si perveniva però alla Tesoreria statunitense, detentrice allora di oltre il 30 per cento dei voti nel consiglio del Fondo.

Tecnicamente si trattava:

1°) di istituire da parte del Fondo certi diritti speciali per sostituirli gradualmente alle riserve monetarie detenute dalle Banche Centrali. Dunque un unico intermediario internazionale valido,

2°) di « consolidare » il debito a breve termine statunitense (e inglese).

In questo modo, in ipotesi, se il paese A si indebitava troppo verso l'estero, si doveva deflazionare la sua circolazione o svalutare il cambio estero (e viceversa, nel caso opposto). Così non sarebbe circolato oro né dollari e si sarebbero regolate le offerte di moneta, ossia la circolazione mondiale. Se poi l'insieme mondiale dei diritti speciali di prelievo, valutabili al tasso fisso x, fosse diventato inferiore ai maggiori bisogni di liquidità, il Fondo avrebbe potuto *de jure* e *de facto* elevare il livello di tali riserve. In questo modo, gli elevatissimi debiti a breve degli USA potevano essere assunti dal Fondo. Però, a lungo andare, il progetto Barber doveva rivelarsi una prepotenza perché gli Stati Uniti potevano cedere enormi quantità di dollari contro il valsente di maggiori importazioni o di acquisti di partecipazioni straniere.

Così gli Stati Uniti avrebbero potuto esportare inflazione per una lunga serie di anni, se non in eterno. Conseguenza pratica di tutto ciò fu però il clamoroso fallimento del 15 agosto che doveva ostacolare pesantemente i traffici mondiali, mentre gli USA potevano continuare ad avere deficit e a produrre inflazione, sebbene J.B. Connally, segretario al Tesoro, il 28.5.71 a Monaco avesse dichiarato: « We are not going to devaluate ».

Così, poco alla volta, era stata introdotta l'idea che il cambio estero dovesse essere fissato dall'alto: un'idea però antica; basta pensare all'epoca del Mercantilismo. E poi, molti anni dopo, venne lo SME. Dirò semplicemente di esso che ancora recentissimamente nei « Money Talks » degli EC *leaders* questi si espressero sempre con linguaggi radicalmente differenti tra loro. Questo è quanto suggeriscono i confronti internazionali della politica monetaria a partire dagli anni Settanta [1].

[1] Per altri più lontani periodi mi permetto di accennare al mio lavoro giovanile (1928) poi

Dunque tutte queste politiche, sia di fatto sia i relativi progetti, non servono in modo sicuro. Gli accordi internazionali sono piuttosto effimeri e valgono soprattutto le pressioni dei più forti. Un ultimo esempio recentissimo è il seguente: le dichiarazioni di invarianza o di nuovi livelli e di riallineamento al livello comunitario vincolati notevolemente dalla politica del paese più forte non sono quelle che dovrebbero essere proprie dei paesi più deboli. In sostanza, a proposito delle pressioni in discorso, gli uffici centrali dei cambi del mondo intero, a partire dal famoso Exchange Equalisation Account inglese, *impediscono* con le loro operazioni – mosse quasi sempre da pressioni politiche sulla Banca Centrale – che i cambi esteri si adeguino alla parità dei poteri di acquisto. (Solo il mercato dei cambi esteri a termine ubbidisce in parte a questa legge di adeguamento, dato che in esso la Banca Centrale fa spesso *swaps* comandati dal potere politico).

Il pericolo perciò è che l'avvenire ne esperimenti altri ancora più deleteri qualora le Banche Centrali non riuscissero ad accordarsi per un funzionamento ragionevole. Allora esse dovrebbero ritornare ai *clearings* o altre compensazioni bilaterali, ma di triste memoria, oppure dovrebbero subire che il paese forte continui a servirsi dei soliti espedienti, con la prospettiva di essere costrette ad accettare il consolidamento di debiti a vista come oramai si sta verificando. Oggi, il risultato più in vista è infatti che gli U.S.A. stanno lasciando fluttuare il dollaro e che si potrebbero dare

– paurose oscillazioni del commercio estero,
– instabilità dell'apparato produttivo,
– debito pubblico crescente,
– M_2 e M_0 crescenti,

nonché la retorica populistica che li accompagna.

Dunque, tutto sembra ritornare come una volta o con forme del tutto nuove di potere politico-economico, intrecciate in modo che solo gli storici futuri e i loro econometrici potranno dipanare e valutare. Tale, ancora ad esempio, quella recentissima, di Clinton (a Frederick, Maryland):

> « President Bill Clinton said the U.S. economy needs low interest rates to keep growing, a message that couldn't be missed by the Federal Reserve that has been considering raising rates to fight inflation. Mr. Clinton, in a speech at a middle class housing development that has expanded rapidly over the past year, said low interest rates are 'worth keeping' because of their role in creating new jobs and spurring new home construction. The

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riedito dalla Cedam dal titolo *Le teorie monetarie e il ritorno all'oro* nonché i tre volumi *Politica monetaria, bancaria e finanziaria*, in edizione litografica esaurita, perché potrebbero ricordare altre tendenze generali di quella economia vista in epoche molto lontane tra loro.

president's remarks may have been aimed at the Fed, which has lowered U.S. rates to 20-years lows but has been debating raising them because of inflationary trends in recent months, or at the Senate, which takes up his controversial budget plan later this month. Pushing his budget plan, Mr. Clinton stressed the number of jobs created by building new homes. Every time mortgage rates go down a point, an additional 350,000 people are able to buy homes » [2].

Quanto ai paesi meno forti, basta vedere l'andamento delle loro M_2. In Italia questa è passata da 695 mila miliardi a 890 mila miliardi, mentre il debito statale è salito da 913 mila miliardi a 1637 mila miliardi, e ciò in 4 anni (1989-1992). Cioè, si inceppa inevitabilmente l'economia dei paesi avviati verso tale politica.

Prima conclusione

Occorre essere molto cauti per quanto riguarda gli accordi monetari internazionali, specie quelli promossi dai grandissimi paesi. Anche nei confronti degli U.S.A. Infatti, la loro politica economica internazionale non solo è da paese più forte, ma dentro di esso è quella del partito dominante. La Banca Centrale ne è totalmente e sempre dipendente. Ciò è pure provato dalle continue oscillazioni del dollaro. Anche in questi ultimi anni, i governatori della Fed non solo sono proposti dal partito vincente, ma ne subiscono le vicende. Negli anni Settanta vi fu staginflation, cioè simultaneamente inflazione e recessione. Negli anni Ottanta l'opposto, cioè caduta dell'inflazione e sviluppo. Anche la politica fiscale discende dagli scopi e dagli errori del partito al potere, e questi dalla maggioranza, cioè dal verso della popolarità. A volte dei contrari ai sindacati con le loro consuete pretese e a volte dei democratici. Attualmente, gli U.S.A., con molte spese pubbliche, stanno facendo inflazione da una parte e tentando accordi bilaterali esclusivi e per lungo tempo (con Giappone, Germania, ecc.) dall'altra, in barba alle esaltate dichiarazioni di anni addietro sul libero mercato. Naturalmente, ciò è affare loro e non nostro, però noi dobbiamo essere cauti e badare solo ai nostri interessi.

Seconda conclusione

Occorre realizzare il commercio estero più intenso e largo possibile

[2] Cfr. *The Wall Street Journal*, June 1993, *passim*.

evitando, almeno per i paesi meno forti, il populismo più deteriore che ostacola il commercio mondiale. Condizione prima di ciò è che i governi e i capintesta delle Banche Centrali non si lascino affascinare dai progetti interessati altrui onde il protezionismo in tante forme.

Ritorna perciò l'insegnamento del membro di sinistra della relazione già esposta. Ma se ci si ostinasse a seguire l'impostazione della parte destra della parità dei poteri di acquisto, quella dei settori particolari, occorre che questi *siano numerosi*, perché solo così ci si può avvicinare, anche non perfettamente, al contenuto del membro di sinistra della relazione, distinguendo, il più sistematicamente possibile, gli effetti sul cambio estero di equilibrio, ma tenendo sotto vigilanza i settori componenti che sono in minore equilibrio. Ciò dicasi specialmente per i settori dei beni capitali, dei beni di consumo, dei servizi, giacché la maggioranza dei loro poteri d'acquisto dovrebbe tener conto del cambio estero di equilibrio. Altrimenti ci sarà crisi o una eccessiva espansione dello sviluppo, con la flying money nei due sensi. A questo riguardo una dura ammonizione da parte della Bundesbank si è già avuta di recente. Traduco: « Sarebbe particolarmente rischioso stimolare l'attività economica con l'aumento eccessivo dell'offerta di moneta ». Cioè essa è stata nettamente contraria sia a Clinton sia alle successive dichiarazioni di H. Christopherson per un « cut » concordato dalle Banche Centrali (rispettivamente del 4 e del 2%) dei saggi di interesse.

È vero che il cambio estero poco favorevole favorisce le esportazioni (anche se non c'è ancora l'acquisto, per poco, delle nostre industrie da parte dell'estero), mentre noi continuiamo a importare molto – troppo – date le condizioni vere dell'economia. Però, con il tempo, si accumulerebbero squilibri spaventosi della bilancia internazionale dei pagamenti (anche se possono essere sopportati da paesi come gli USA). E con ciò si stravolgerebbero non solo le sane esigenze di ogni sistema monetario ma anche quelle di tutta l'economia. In particolare, seguendo il membro di destra della relazione esposta in precedenza, si avrebbe una crescita troppo elevata della M_2. Ciò non deve essere mai ignorato dalle Banche Centrali dei paesi meno forti. Ciò invece è accaduto ed è dimostrato: dai numerosi interventi nella guida e nella difesa del cambio estero e dei saggi di interesse; dagli acquisti affrettati di titoli esteri e nazionali incluse le operazioni di pronto contro termine; dalle emissioni obbligazionarie in valuta estera. Né si può con precipitazione pensare di annullare la, a lungo discussa in parlamento, legge del 1936, specialmente il suo solenne divieto delle strutture proprie delle « banche universali » e delle partecipazioni bancarie nelle industrie.

Diversamente, si terrebbero lontani: la sorveglianza; i riscontri senza indulgenze; e le pressioni disinteressate, giacché i settori fanno sempre muro

chiuso solo con i propri interessi e con i propri mezzi, in un inesplicabile intreccio, onde forti possibilità di avventure e affari economico-politici di imprevedibile fattura, seppure talvolta limitati grazie alla fermezza esemplare di altissimi esponenti delle Banche Centrali.

Ogni altro tipo di calcolo avanzato in argomento si ridurrebbe a quello già indicato dal membro di destra della relazione contenuta nel preambolo metodologico e quindi si accompagnerebbe a un fattore K o sopra o sotto l'unità e ciò a seconda dei vettori e sottovettori che sono scelti per indicare i Numeri Indici dei prezzi e le quantità scambiate.

Come parola finale per questa *seconda conclusione*, è da notarsi che la recente caduta di certi saggi di interesse è più opera della recessione in corso che della pur drammatica ascesa di M_2, ma l'esigenza e l'attualità del monetarismo sono sempre valide (seppure insieme con nuove future manovre della speculazione sia nazionale che internazionale) sebbene tutte le principali conseguenze di politica economica, monetaria e bancaria siano naturalmente ancora da determinare con precisione. Non entro in questo complesso problema.

Terza conclusione

Essa si riassume nella parte sinistra della formula già indicata. In più, per l'Italia, come obiettivo concreto di breve e lungo andare, dovremmo difendere ogni tendenza verso prezzi sotto il livello di quelli della concorrenza estera più importante, anche se ciò significa rivedere di tratto in tratto la politica del cambio estero fisso. Con questa visione propria del fattore $K = 1$ diminuirebbe *ipso facto* la rischiosità di molti impieghi aventi persistenti crediti in sofferenza, posizioni ineguagliate, rate molto arretrate e altro, specie in alcune regioni come il Mezzogiorno; cioè, in ultima analisi, il coefficiente di solvibilità dell'intero sistema bancario nazionale sarebbe tenuto più vicino alle norme suggerite dalle autorità comunitarie, riducendo anche il pericolo di altre pesantissime perdite incontrate dalla Banca Centrale per effetto di forti differenziali fra acquisti e vendite di disponibilità valutaria estera. Perciò, se il livello del cambio estero si attenesse alla parità dei poteri di acquisto indicata dal membro di sinistra della relazione o a quello di destra ma, corrispondente al fattore $K = 1$, le perdite sarebbero certamente minori.

Tanto più vale l'insegnamento deducibile dal membro di sinistra in quanto, in questo momento storico, si tende ad allargare il GATT con nuovi motivi di scambio che riguardano soprattutto i servizi (specie per via della

crescente, ineluttabile e forse definitiva disoccupazione tecnologica prodotta dai robot). Tutto questo anche perché dovremo operare con paesi molto distanti economicamente, come la Russia, l'Asia e l'America meridionale e sempreché l'Uruguay round dovesse avere un corposo seguito.

TRANS- AND INTER-TEMPORAL MONETARY POLICIES AND THE *K* FACTOR

The ascertainment that old and new types of calculation of purchasing power parities have caused and cause several economic disequilibria has, as a result, suggested the author to express these economic anomalies in terms of the technique of a moving parameter, the *K* factor. Additional clues to these anomalies come from the trans- and inter-temporal history of monetary policies during the last 30 years and at present.

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DETERMINANTS OF ECONOMIC GROWTH: DOES THE STAGE OF ECONOMIC DEVELOPMENT MATTER?

by
William R. DiPietro *, Bansi Sawhney ** and Rama Jampani **

I. *Introduction*

The purpose of this paper is to see whether and to what extent the effect of variables important for growth do or do not change over the course of economic development. Empirical literature on the determinants of economic growth is rich and growing. However, most studies lump all countries together regardless of the level of economic development, and thus the generalizations reached in these studies have limited policy implications. Policies appropriate for advanced countries may not be suitable for less developed ones and may even be misguided or even harmful if their stage of development has not been taken into account. It is vital to examine the relative significance of a factor at a country's stage of development and pursue appropriate policies to promote growth. In order to accomplish this task, we will estimate cross-sectional growth equations for 107 countries for 1970 to 1988 breaking the sample into high, middle and low income countries.

Giving a new twist, such as adding important variables not previously considered to production function growth equations, is a well established path followed by a number of authors in the recent empirical economic literature. The key variable of interest for Fosu (1992), is political instability. Along with the traditional production function inputs of labor and capital, he adds a measure of political instability, and, for a sample of 31 sub-Saharan African countries, finds that political instability has a significant negative impact on economic growth.

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Edward (1992) focuses on trade orientation. He uses several different measures of trade orientation in his cross-sectional growth equations and finds that countries with more open trade policies tend to grow faster than those with more restrictive trade practices. In addition, his findings lend support to the convergence hypothesis, that countries that start further behind tend to grow faster and catch-up to their previous technological superiors.

The central concern of both Dollar (1992), and Alam (1991), is also on the relationship between trade orientation and growth. Dollar develops his own index of trade openness, and, regressing on a sample of 95 developing countries for the period 1976-85, finds that outward orientation increases economic growth. Alam uses trade orientation dummies based on a fourfold trade orientation classification scheme of the world bank for his growth equations on 41 developing countries. He, too, finds a positive relationship between outward orientation and growth after accounting for the growth of factors and the level of investment relative to GDP [1].

De Gregorio's (1992), restricts his growth equation to Latin American countries. Fearing estimation bias from omission of important variables, he includes a whole host of variables in his growth equation. He finds that foreign investment, political stability, and human capital, as measured by literacy rates, have a positive effect on growth in Latin American countries, while inflation and government consumption have a negative effect. In contrast to Edward's findings, the degree of trade openness does not have a significant effect on growth and for his sample of Latin American countries there is little support for convergence.

Grier and Tullock (1989), pool cross-section and time series on 113 countries for their growth equations. Their results support the convergence hypothesis. In addition, they find that government share in GDP and variability in inflation both have a negative effect on growth. Similarly, Barrow (1991) finds that the convergence variable is significant and that low levels of human capital adversely affect economic growth.

Finally, although by no means inclusively, mention should be made of Levine and Renelt study (1992). They do a sensitivity analysis of cross-country growth regressions to see which of the myriads of variables used to explain growth are robust under alternative equation specifications. They find that the share of investment to GDP is a robust variable, give qualified

[1] GREENWAY and CHONG (1988) corraborate the findings of Edwards, Dollar and Alam. They do not use regression analysis, but subjectively classify countries on the basis of trade orientation. They find that countries classified as more outward as opposed to more inward orientated tend to have higher growth rates.

support for the convergence hypothesis, but find that trade policy and a whole host of fiscal indicators are not robustly correlated with growth. Lucas (1988) and Stern (1989) also review the neoclassical determinants of growth and suggest that a broader view of advancements should include health, education, political liberties and the environment.

II. *The Central Theme*

Our central thesis is whether or not a variable is important for growth for a country, and, if it is important, whether its impact on growth depends upon its stage of development [2]. Among what we might call the common variables, variables that are relevant for growth at all phases of development, there will be some that gain in importance as development proceeds and others that diminish in importance as development marches forward. There will be factors that are growth determinants solely for countries at low levels of development and other variables that are growth determinants strictly for countries at high levels of development. Indeed, if this is not the case, what can we possibly mean by economic development?

Structural changes in the development process necessarily take place. What determines the changes in the structure of an economy over time is a complicated phenomenon. An important question to ask is what factors and policies have what impact on economic growth of a country at different stages of development.

Therefore, in this study, separate cross-sectional growth equations will be run for different levels of development, and we will consider anew many of the variables in cross country growth equations already developed in the literature, but from a new perspective; namely, their changing importance and changing impact as development proceeds.

III. *Growth Determinants and Development: Theoretical Expectations*

This study will use eight variables as explanatory variables in its cross-country growth equations. They are labor growth, capital growth, capital efficiency, human capital, openness, Foreign Direct Investment, government size, and convergency. Let us look at each of these and see how their impact on growth might be expected to change with economic development.

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[2] This was also a theme employed in our paper, SAWHNEY and DIPIETRO (1991).

One of the key independent variables typically found in cross-country growth equations is labor growth. As a factor of production, it is naturally expected to have, and has been found to have, a favorable effect on growth. Is there any reason to expect that the impact of this variable will change with development? Most certainly, there is. Countries at low levels of development are typically awash with excess labor so that adding additional labor is not likely to do anything to enhance their growth performance. Countries at high levels of development, on the other hand, are capital rich and labor scarce. Therefore, output growth in these countries should be very sensitive to additional increments of labor.

The other crucial factor of production, capital, theoretically should work in reverse fashion to labor in terms of its effect on growth with development. The growth of capital should be more important for capital scarce countries at low levels of development than it is for capital rich countries at high levels of development.

For similar reasons, our third variable of interest, the efficient use of the capital stock, measured in our case by the change in output to change in investment ratio, should be more important for growth in less developed countries than in more developed countries.

Our fourth variable is human capital. One, of course, would expect human capital to act in a similar fashion to physical capital. The already high existing level of human capital in highly developed versus less developed countries should, working through diminishing returns, lessen the augmentation to growth brought through increases in the stock of human capital as development progresses.

With regard to economic openness or trade regime, a variable frequently used in cross-sectional growth analysis, once again, one might expect a differential effect on growth at different levels of development. While openness is certain to contribute to growth at higher levels of development, the effect of openness at lower levels of development is open to controversy. Some would argue that protectionism is necessary in order to give infant industries a chance to develop. If this is true, then increased levels of openness will retard growth for countries at low levels of development. On the other hand, others argue that trade acts as an engine of growth. In this case, trade regimes promoting higher degrees of openness will increase growth for countries at low levels of development, just like it does for countries at higher levels of development.

Our next variable is Foreign Direct Investment (FDI). One would expect this variable to be particularly important for growth of less developed countries, but to wane in importance with development. FDI's positive

effect on growth of countries at low levels of development is likely to be multi-dimensional. Foreign Direct Investment facilitates technology transfer, increases the exposure and absorption of new ideas in the host country, and provides one means of overcoming potential supply bottlenecks that retard economic growth [3]. Surprisingly, however, it should be mentioned that Saltz (1992) finds a negative correlation between FDI and economic growth in the case of developing countries.

The seventh variable, the effect of the size of the government on growth, is a bit controversial. Those with socialistic leanings would tend to argue that more government is good for the economy. Some might additionally argue that the positive effect of government might be particularly pronounced at early stages of development, since, at early stages of development, scarce administrative and entrepreneurial talent could be more readily and effectively mobilised by a central government. Conservatives, on the other hand, would argue that bigger government suffocates the private sector and promotes inefficiency both within the government sector itself and in the system as a whole. Getting a developing country hooked on government, just like on drugs, in their view, is a certain path to long term disaster.

The last variable we have selected to try to explain economic growth is convergence. According to the convergence theory, countries originally with lower levels of GDP will tend to catch up with countries with higher initial levels of GDP by growing faster. One would, therefore, expect this variable

TABLE 1
EXPECTED THEORETICAL SIGN AND CHANGE IN IMPACT WITH DEVELOPMENT

Variable	Sign	Change with Development
1. Labor Growth	Positive	Increase
2. Capital Growth	Positive	Decrease
3. Capital Efficiency	Positive	Decrease
4. Human Capital	Positive	Decrease
5. Openness	Uncertain	Uncertain
6. FDI	Positive	Decrease
7. Government Size	Uncertain	Uncertain
8. Convergence	Negative	Decrease

[3] UNITED NATIONS (1992, ch. VIII) there is a more detailed discussion of the multiple reasons why Foreign Direct Investment is important for growth in developing nations.

to be more important for less developed countries, as they are the countries that are further behind.

Table 1 presents in summary fashion the expected theoretical sign (positive, negative, uncertain) and the expected change in impact with development (increase, decrease or uncertain) for each of our growth accounting variables.

IV. *Analysis of Empirical Results*

Data was collected on 107 countries for the period 1970 to 1988 and cross country regressions were run for three different levels of development: low, middle and high. Countries were classified as low income developed if their per capita income in 1980 was less than $2000 U.S., middle developed if their per capita income was between $2000 and $6000, and highly developed if their per capita income was above $6000. Appendix A lists the definitions of the independent variables used in the statistical analysis.

Table 2 shows the basic statistical results with *t*-statistics in parentheses and stars on coefficients significant at the ten percent level or better, while Table 3 gives the empirically observed signs and observed changes with development. Table 3 is directly comparable to Table 1 which gives the theoretical expectations. It should be noted that the change with development column of Table 3 was constructed by looking at the differences between the two extreme groups, the low income and the highly developed groups. Let us focus on Table 3 first and return later to the raw empirical results of Table 2.

How do the empirically observed results of Table 3 compare with the theoretical of Table 2? The empirically observed signs on the explanatory variables are exactly in line with a priori expectations. In the two uncertain cases, openness and government size, sign reversals occur between the low and the highly developed countries. Statistically, openness exerts a negative impact on growth for the low developed countries, and a positive impact on growth for the highly developed countries, while government size exerts a positive impact for low developed countries and a negative impact for highly developed countries.

As to the empirically observed as opposed to the theoretically anticipated changes in importance of the variables on growth with development (the change with development columns of Tables 1 and 3), for six of the eight variables the empirically observed change in the coefficient with development is consistent with theoretical expectations. Curiously, the two excep-

TABLE 2

CROSS SECTIONAL GROWTH EQUATION RESULTS 1970-1988

	Highly Developed	Middle Developed	Lowly Developed
Intercept	* −15.65 (−2.07)	0.10 (.04)	2.38 (1.55)
L	* 1.11 (3.32)	0.128 (.49)	0.39 (.74)
I	0.10 (1.73)	* 0.13 (3.28)	0.05 (.93)
O/K	* 0.016 (1.21)	* 0.06 (1.97)	* 0.02 (2.41)
HDI	* 0.015806 (2.03)	* 0.00395 (2.13)	* 0.0059 (2.21)
Open	0.01 (1.18)	−0.00 (−.01)	−0.03 (−1.58)
FDIY	0.17 (.44)	0.88 (1.14)	* 1.56 (2.85)
G	−0.04 (−1.00)	−0.02 (−.44)	0.02 (.51)
YPC70	* −0.000066 (−1.91)	* −0.00109 (−2.97)	* −0.0027 (−3.12)
	RSQ = .81 *DF* = 18	*RSQ* = .72 *DF* = 34	*RSQ* = .59 *DF* = 46

tions are the two capital variables, physical and human capital. The coefficients on both capital growth and human capital surprisingly increase as development proceeds, unlike what one would anticipate on the basis of diminishing returns. Perhaps there is some need for rethinking the role of capital in its two forms with development. Perhaps the increase of human and physical capital together with development creates a synergistic effect on productivity that more than overcomes the negative impact of diminishing returns. This would be consistent with a recent article in the *Journal of*

TABLE 3
STATISTICALLY OBSERVED SIGN AND CHANGE IN IMPACT WITH DEVELOPMENT

Variable	Sign	Change with Development
1. Labor Growth	Positive	Increase
2. Capital Growth	Positive	Increase
3. Capital Efficiency	Positive	Decrease
4. Human Capital	Positive	Increase
5. Openness	Uncertain	Uncertain
6. FDI	Positive	Decrease
7. Government Size	Uncertain	Uncertain
8. Convergence	Negative	Decrease

Economic Literature in which Nelson and Wright (1992) assign great importance to the development of professional peer-group communities in accounting for productivity gains. Perhaps the capital between less and highly developed countries may even be considered to be of a different kind, further explaining why foreign direct investment is so important for growth in less developed countries.

Turning our attention back to Table 2, it is to be noted that the eight independent variables under review do a pretty good job in explaining the variation in growth over the cross-section of countries for the various stages of development. The R-squares range from fifty-nine percent in the low income developed countries to eighty-one percent in the highly developed countries. Except for openness and government size, all the variables are significant at the ten percent level or above in at least one of the three regressions representing the different stages of development.

V. *Summary and Conclusion*

Investigating the determinants of economic growth has been a subject of increasing interest in recent years. Most studies, however, have not related the determinants of growth to a country's level of development. In this paper it is argued that the role of economic policies and the importance of the factors of production may vary between low, medium and high income countries. Countries at lower stages of development may call for policies that are not relevant for countries at higher stages of development.

This paper finds that although capital both physical and human are both essential to the growth process, their contribution changes through the

stages of economic development. Similarly labor growth contributes significantly more to growth in the high and middle income countries, but its role diminishes in labor rich, less developed countries. The question as to how open the economies should be has not been answered fully in the literature. This study suggests that less developed countries should not blindly go for more and more openness, but should first study the costs and benefits of more liberalized policies before deciding on the degree of openness for their countries.

APPENDIX A

Variable Names and Definitions

1. *L* (Labor Growth) – Average Labour Growth from 1970 to 1988
2. *I* (Capital Growth) – Average Gross Investment to GDP ratio from 1970 to 1988
3. *O/K* (Capital Efficiency) – Average Change in GDP to Change in investment ratio from 1970 to 1988
4. *HDI* (Human Capital) – United Nations Human Development Index for 1990. The index varies from zero to one thousand.
5. Open (openness) – Average percentage of exports plus imports over GDP from 1970 to 1988
6. *FDIY* (*FDI*) – Average ratio of Foreign Direct Investment to GDP from 1970 to 1988
7. *G* (Government Size) – Average percentage of Government spending to GDP from 1970 to 1988
8. *YPC*70 (convergence) – Per Capita income in 1970

NOTE: The dependent variable is the average rate of growth from 1970 to 1988.

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DETERMINANTI DELLA CRESCITA ECONOMICA: È IMPORTANTE LO STADIO DI SVILUPPO ECONOMICO?

In questi ultimi anni vi è stato un rinnovato interesse nella letteratura sia nell'identificazione delle determinanti chiave della crescita economica sia nella misurazione del contributo individuale di ogni variabile alla crescita. Questo articolo cerca di tener conto delle fasi dello sviluppo per verificare come alcune delle piú importanti variabili determinanti della crescita usate in letteratura varino secondo lo stadio di sviluppo. I risultati empirici di questo studio indicano che gli stadi di sviluppo economico hanno molta importanza nel determinare il peso di una variabile per la crescita economica.

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INSTITUTIONAL INSTABILITY AND ECONOMIC GROWTH IN SUB-SAHARAN AFRICA

by
JOHN MUKUM MBAKU *

1. *Introduction*

It has been more than three decades since the majority of countries in sub-Saharan Africa gained independence. Recent studies show that, except for a few countries, most of the region has not experienced any significant economic growth. Between 1965 and 1989, for example, over eighteen countries in sub-Saharan Africa encountered negative economic growth, as measured by the average annual growth rate in the gross national product (GNP) per capita. While Botswana, Burundi, Cameroon, Congo, Lesotho, Mauritius, and Seychelles performed relatively well during this period, most of the countries of the sub-Saharan African region either grew only marginally or regressed economically (World Bank, 1990a, 1990b, 1991a, 1991b).

Significant research has been done to determine the obstacles to economic growth in sub-Saharan Africa. Both internal and external causes of the region's stagnation have been identified. The economic policies of the developed countries, the international economic system, in which most producers of raw materials or primary commodities are unable to compete effectively, and natural disasters are some of the external causes of the region's poor economic performance. Internal constraints to growth include excessive state control of economic activity, bureaucratic corruption, extremely high population growth rates, and political instability (OAU, 1981; World Bank, 1981; Ergas, 1986; Mbaku, 1992a).

Many researchers have argued that economic growth in a country is

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affected by the security of property rights in that society. Those who provide funds for capital formation expect to be able to receive the earnings produced by their savings. As a result, savers must be assured, to a reasonable degree, that they will have access to their earnings. Political instability has a negative effect on the security of property rights, and as a result, lowers the level of domestic savings and subsequently capital formation. Political instability is also known to cause capital flight including the exodus of skilled professionals (Scully, 1988).

Since 1956, more than sixty coups d'état have taken place in sub-Saharan Africa. The coup is now considered the most important method of governmental change in the region. The increased reliance on nonconstitutional methods of regime change has increased political instability and significantly stunted economic growth in this part of the world (McGowan & Johnson, 1984; Mbaku, 1988; Mbaku & Paul, 1989; Jenkins & Kposowa, 1990).

In this paper, I examine the relationship between political instability and economic growth in sub-Saharan Africa. Specifically, the paper will attempt to show, empirically, that political instability has a negative impact on economic growth in sub-Saharan Africa. Following other researchers (e.g. Ram, 1985, 1986; Fosu, 1990, 1992), a model based on the neoclassical production function will be tested using data on sub-Saharan Africa. The results obtained should provide the information needed to evaluate the impact of political instability on economic growth in the region.

II. *Political Instability and Economic Growth in sub-Saharan Africa*

Many researchers regard political instability as one of the most important obstacles to economic growth in Africa (Ergas, 1986; Mbaku, 1988, 1992b). As was mentioned earlier, the military coup has become the most important method of regime change in post-colonial Africa. In addition, many countries in this region have either suffered from some form of civil strife or have been involved in an international conflict. Many others have encountered significant levels of ethnic conflict. Few countries in sub-Saharan Africa have been able to develop viable and sustainable political institutions since they gained independence in the 1960s (Mbaku, 1988; Mbaku & Paul, 1989; Jenkins & Kposowa, 1990; Baynham, 1991).

Most of the political instability that sub-Saharan Africa has encountered during its first three decades of independence has come primarily from (i) military coups; (ii) secessionists movements; and (iii) wars fought to

determine who should rule the country. On November 17, 1958, soldiers under the command of General Ibrahim Abboud seized strategic government installations in the city of Khartoum, overthrew the government of the Sudan, and ushered in the first successful military coup in modern sub-Saharan Africa (McGowan, 1986). Since then, many other successful coups, attempted coups, and plots to overthrow the government, have taken place in the region. By 1989, the military, through the use of violence had become a significant part of government in many sub-Saharan African countries. In fact, countries like Ghana, Nigeria, Sudan, and Libya have been ruled by soldiers during most of these countries' existence as independent states (Baynham, 1991).

In 1966, the Nigerian military conducted what has been referred to as a pro-Ibo coup d'état. Several senior Nigerian politicians, including the prime minister, Sir Abubakar Tafawa Balewa, were killed. Following the coup, General Aguiyi Ironsi, an Ibo, was installed as the military ruler of the country, instilling fears in the hearts of northerners that the country would be dominated by easterners. Subsequently, anti-Ibo riots broke out in the northern regions of Nigeria, leading to a second coup in which General Aguiyi Ironsi was murdered by northern army officers. Emerging out of this chaos as the country's new leader was General Yakubu Gowon, a northern Christian. Soon after he took office, General Gowon was confronted by irredentist groups, most of which felt that a united Nigeria could no longer guarantee their safety. Before the government could give any serious consideration to these issues, news arrived at the federal capital that thousands of Ibos resident in the north had been massacred by northerners. Ibos retaliated by killing Hausas living in the east. The pogroms apparently continued until most Ibos had fled to the north and most Hausas had left the east. At this point, the Ibos, afraid that they could never feel secure in a united Nigeria, declared their intention to secede and form the independent state of Biafra, ushering in a bloody civil war that killed more than 600,000 people and destroyed the Nigerian economy (Madiebo, 1980; Baynham, 1991).

Shortly after Belgium withdrew from the Congo on June 30, 1960, the mineral rich region of Katanga revealed its intention to secede from the rest of the country. With the assistance of Belgian entrepreneurs and white mercenaries, Moïse Tshombe declared the province the independent state of Shaba. Tshombe's activities led to a civil war that lasted from February 1961 to January 1962. Out of the chaos that followed, Colonel Mobutu emerged as the country's leader. In 1965, he proscribed all political parties, made himself president and ushered in an authoritarian regime that, by

1989, was still in power in what is now called Zaïre (Lumumba, 1962; Young, 1965; Hoskyns, 1965; House, 1978; Baynham, 1991).

In addition to the secessionist wars in Nigeria and Zaïre, other sub-Saharan African countries have also been involved in civil strife. Ethiopia, Chad, Angola, Mozambique and Sudan have fought at least one civil war each since they were independent. These latter conflicts, however, were not fought over the issue of secession, but to determine who would rule the country. For example, in Mozambique, the South African-supported group, *Resistência Nacional Moçambicana* (Renamo) has been fighting a bloody war since the early days of independence in an attempt to seize the apparatus of government from the *Frente de Libertação de Moçambique* (Frelimo). Frelimo inherited the government from the Portuguese when the country became independent in 1975 (Morgan, 1990).

How does political instability affect economic growth in sub-Saharan Africa? As discussed earlier, the security of property rights is important to savings. Military coups, civil strife and war, which reduce the security of property rights, have contributed to reduced savings, capital flight, and brain drain. The subsequent reduction in capital has been very devastating to many of the region's economies, especially in the midst of significant increases in population growth (Mbaku, 1988). Some writers have argued that shortages of investment funds in many poor countries can be met with inflows of foreign capital. Unfortunately, political instability discourages the flow of foreign investment (Mbaku, 1988, 1992b).

War and ethnic violence kill a lot of people, depriving the country of significant numbers of productive resources. The civil war in Nigeria, for example, took the lives of more than 600,000 people, many of them in their most productive years. In addition, war destroys the national infrastructure. National structures such as roads, railways, communications installations, health facilities, schools, etc., may be destroyed by war. Additionally, other important capital structures such as bridges, telephone polls, electric plants, irrigation canals, and airports, may also be destroyed during a war. In fact, wars in Angola, Mozambique, Nigeria, Ethiopia, and Chad, have destroyed significant amounts of these countries' physical capital. Damage in the infrastructure inflicted by war may significantly reduce the country's productive capacity and stunt economic growth and the ability of the economic system to feed the people and deliver increases in the quality of life of the citizens (Mbaku, 1988; Cornwell, 1991). Available data appear to indicate that the sub-Saharan African countries that have either fought civil wars or have had significantly high levels of political instability since independence, have also been among the poorest performers economically. For example, during the

period 1965-1989, Sudan, Mozambique, Chad, Ghana, Benin, Uganda, Nigeria, Angola, Ethiopia, and Somalia, registered very high rates of political instability, either because of pervasive coup activity or some form of civil strife. As measured by growth in the gross national product (GNP) per capita, these countries are among the poorest performers in the region. Except for Nigeria and Somalia, which both had marginal growth rates in the GNP per capita of 0.2% and 0.3% respectively, all the countries mentioned encountered negative growth rates in their per capita incomes during the period 1965-1989. Even Nigeria's enormous oil wealth was not enough to save the country from the rampages of a bloody civil war and more than a decade of perverse economic policies advanced by its many military governments (World Bank, 1990a, 1990b, 1991a, 1991b).

During war, the education of the young suffers. Funds for education are usually diverted to military spending, school facilities may be destroyed or turned into military use, and children drafted to fight either for the government or in the armies of the opposing forces. In addition, most of the country's skilled manpower is usually reassigned to the war industry. In a number of sub-Saharan African countries that have been involved in civil wars, many skilled professionals have left to seek employment overseas, and a number of students who were training at foreign universities have refused to return home after completing their education. In fact, during war, spending on most social programs may be halted completely. As a result, hospitals, rural dispensaries, schools, and other public service centers may be destroyed or abandoned (Mbaku, 1988; Cornwell, 1991). The destructive force of war to a nation's economic capacity can be illustrated by Renamo's activities in rural Mozambique. This guerilla group has destroyed rural agriculture in many regions of the country, contributing significantly to Mozambique's designation as the second poorest and least developed country in the world (World Bank, 1992). According to Morgan (1990), "Renamo forcibly extracts food, clothing and services (particularly labour for porterage) on a regular basis" (p. 75). In some areas of the country, the local people are permanently "engaged in helping the rebels, often in extremely brutal conditions. They have to work in the fields to provide [Renamo] with its food requirements, and are also heavily engaged in porterage duties, often over long distances and suffering very harsh treatment" (Morgan, 1990, p. 75). In addition, Renamo's unwillingness to distinguish between military and civilian targets has resulted in significant destruction of rural agriculture in Mozambique (Morgan, 1990).

The issue of military expenditure is a serious one for sub-Saharan African countries. In addition to raising the level of foreign debt, African

economies must produce more export or cash crops in order to earn the foreign exchange needed to purchase arms from abroad. Quite often, foodstuff production is neglected in favor of the production of crops that can be sold in the international marketplace for resources to purchase arms. In addition, some African countries have used foreign economic aid to pay for military equipment. For example, Mengistu's Ethiopia used emergency aid shipments to pay for Soviet arms for use in its fight against Eritreans and the Tigrayans. Many international aid agencies have increasingly found it either difficult or impossible to operate in war-torn areas. In some instances, these agencies have taken their operations to other needy but more stable areas. A continuous culture of violence, thus, is quite damaging to economic growth (Cornwell, 1991).

War and ethnic violence have a very damaging effect on the country's food supplies. From a production point of view, forced conscription to fight deprives the agricultural sector of productive resources, thus reducing national food supplies. In addition, military activities may destroy farms, livestock, and the general environment. Usually, livestock is "pillaged or requisitioned by armed men whom civilian populations are unable to resist" (Cornwell, 1991, p. 75). Perhaps, the most visible example of the effects of war on the environment are provided by Ethiopia. During the more than three decades of fighting between the central government in Addis Ababa and secessionist groups in Eritrea and Tigray, military campaigns have managed to completely destroy a significant portion of the country's agro-ecological system. Like Mengistu's regime in Ethiopia, few governments faced with a fight for their very survival would give any priority to environmental protection. In fact, such governments may actually inflict significant damage on the environment if such activities help the incumbent maintain a monopoly on power. In Ethiopia, the central government implemented policies that actually exacerbated the northern famines in order to weaken the ability of the Eritrean and Tigrayan rebels to continue to wage war (Kebbede, 1992).

Trade between the rural agricultural sector and the urban centers, which is crucial for the survival of the non-food producing urbanites, is usually destroyed during war. In addition, vital supplies from the urban sector which are needed for rural production can no longer be obtained. War, as such, has a very important effect on food supply and its distribution. In fact, most of the countries on the United Nations' list of African countries that were most affected by hunger in 1985 were at that time fighting civil wars. Ethiopia, Sudan, Chad, Angola, and Mozambique are the African countries with the most serious famine problems. These are also the countries which for the last several years have been caught in the

throes of civil war. In fact, some writers go as far as saying that recent Ethiopian famines have been intensified by deliberate action by the military government to punish the rebelling northern region. In Ethiopia, war, famine, political and economic repression, and agro-ecological catastrophes have killed thousands of people, further eroding the country's productive capacity. In addition, these conditions have caused a significant refugee problem as citizens flee the harsh environment created by war and persistent political instability (Kebbede, 1992).

In many African societies, farm animals play a very important role in the lives of the people. Livestock usually has very important social and ritualistic significance. In addition to the fact that soldiers often confiscate livestock for their own use, war may interfere with veterinary services, leading to a spread of disease and a subsequent loss of one's stock of animals. In addition to damaging the rural economic system, such a massive loss of livestock could also disrupt the fabric of social life in the villages (Cornwell, 1991).

War and prolonged political repression can damage the social structures of rural villages and corrupt their value systems. In addition, war can also uproot people and force them to live in crowded refugee camps indefinitely. Others may be forced to leave their ancestral lands and migrate to hostile environments, as was the case with Eritreans and Tigrayans who had to leave Ethiopia and wonder the streets of Khartoum (Sudan) in search of opportunities to earn a living (Kebbede, 1992). Villages and societies that lose most or all of their property to war may eventually turn to banditry in order to survive. As has been stated by Cornwell, the "wanton destruction of life and property and the military use of terror undermine the sense of values and of the dignity of humanity" (Cornwell, 1991, p. 75). The senseless use of terror can have long-lasting effects on children. Some observers believe that Museveni's use of children as soldiers in Uganda may have destroyed their sense of values. An observer, speaking of these children, has noted that they "are growing up without any sense of values ... They know nothing but the gun" (Rosenblum & Williamson, 1990, p. 125).

What these few examples have shown us is that political instability has a significant negative impact on economic growth. The primary purpose of this paper is to provide empirical evidence to support that contention. Before undertaking the empirical testing, however, it would be pertinent to examine how political instability is measured. Thus, in the following section, I define political instability and discuss its measurement.

III. *Political Instability and Its Measurement*

Political instability is regarded by several researchers as one of the most important constraints to economic growth in sub-Saharan Africa (Ergas, 1986; Mbaku, 1988). Political instability is usually defined in terms of either a challenge to the rules governing a polity or a change in the polity's political system. The change in the government could include a reshuffle of the cabinet, displacement of the head of state, or a change in the representation on the ruling cabinet by political parties, following an election. Attempted or unsuccessful coups and motions of censure against the government sponsored by opposition parties represent examples of challenges to the regime. Although political instability is often associated with an actual change in the government or regime norms, a serious challenge to the government, however, can result in significant levels of political instability. While attempted coups and plots against the government usually do not result in regime change, such activities represent strong challenges to the political system and can lead to political instability (Morrison & Stevenson, 1971; Sanders, 1981; Mbaku, 1988).

Morrison and Stevenson (1971, p. 348) define political instability as "a condition in political systems in which the institutionalized patterns of authority break down, and the expected compliance to political authorities is replaced by political violence". Political instability is seen as resulting from the struggle between economic agents in a country "over the values governing the rewards in a society" (Morrison & Stevenson, 1971, p. 349). In order to fully understand political instability, one must take a look at the "power relationships that exist between different economic agents in the country" (Mbaku, 1988, p. 90).

Three types of political instability are recognized in the literature: elite, communal and mass political instability (Morrison and Stevenson, 1971; McGowan, 1975). Elite political instability results from situations in which a country's ruling elites or those holding leadership positions in the nation's political system are forcefully removed from office. Behaviors associated with elite political instability include coups d'état, attempted or unsuccessful coups, and plots. Individuals staging a coup d'état usually intend to remove from power, by force, the country's chief executive. The majority of coups are conducted by elites representing competitive groups. Since the 1960s, when many sub-Saharan African countries began to achieve independence, many of the coups in the region have been conducted by military elites (Mbaku, 1988).

Attempted coups are those in which the sponsors are unable to capture

the apparatus of government. Unsuccessful attempts to overthrow the government can be very violent since they may involve assassination of members of the incumbent government. Additionally, the coup perpetrators may arrest and detain national elites, capture and occupy important national installations such as television and radio stations, military depots, and other government structures. Attempts to overthrow the government can involve the participation of elites representing more than one competitive group. For example, civilian elites may work with military leaders to conduct a coup. In the event of success, the civilian elites may be expected to rule the country while the military provides the coercive force needed to prevent regime destabilization. Alternatively, the post-coup government could be a diarchy, a type of regime in which military and civilian elites rule the country.

Among the behaviors associated with elite political instability, plots are the most difficult to validate. The main source of information about a plot is the incumbent government. A coup plot involves situations in which the incumbent government announces that it has uncovered a conspiracy to overthrow the regime. Even though it is very difficult to validate the claim made by the government with regard to a coup plot, it is important to note that the announcement by the government, of a plot, in itself, represents an important source of political instability (McGowan, 1975; Mbaku, 1988, 1989a).

Communal instability is usually caused by attempts by communal groups to either overthrow the government or dissolve their relationship with the present polity and unite with another state or form their own country. Communal groups can be identified by characteristics such as ethnicity, language, religion, territory, or a combination of any of the above traits. Behaviors that create communal instability include civil wars, rebellions, irredentism, and ethnic violence. Individuals or groups supporting political rebellions usually expect to gain more political freedom or autonomy for themselves within the present state. Those groups that stage or support a civil war either intend to secede from the present polity and form their own country or capture the government in the state in which they now reside. When communal groups act to sever their political relationships with the state in which they presently reside and form a new union with either an existing country or a new one, this behavior is called irredentism. The majority of irredentist groups usually have communal ties with members of the country they seek to join (Mbaku, 1988).

Mass political instability, which involves situations in which mass groups violently attack national elites, is the third type of political instabili-

ty. Mass movements exist for the purpose of maximizing some given objective. As a result, membership in a mass group is open to those who support or subscribe to the goals of the movement. While membership in many mass groups can be homogeneous with respect to class, power and status, these groups often do not have communal traits that can be used to describe them. The most important characteristic of a mass movement is that its members usually believe in the goals and objectives of the organization. Behaviors associated with mass instability include riots, armed attacks, revolutions, political strikes, and assassinations. It must be noted, however, that unless behaviors contribute to regime instability or threaten the national political system, they are not regarded as determinants of mass political instability. Thus, strikes by labor unions for increased wages and benefits, murder, armed robbery, and other criminal activities may not qualify as contributors to mass instability (Morrison and Stevenson, 1971; Hibbs, 1973).

Elite and communal instability have been found to be the most common types of instability in developing countries. Morrison and Stevenson (1971) found that elite and communal instability were "well defined independent dimensions of political instability" in sub-Saharan Africa. They, however, determined that mass instability was not a determinant of political instability in the region. This article will examine the relationship between elite political instability and economic growth in sub-Saharan Africa. Following other researchers, (e.g. McGowan, 1975; McGowan & Johnson, 1984; Morrison et al., 1989), elite political instability shall be indexed by coups, attempted coups, and plots to overthrow the government. To develop a quantitative index to measure elite political instability, I follow other researchers and assign a numerical value of 5 to coups d'état, 3 to attempted coups, and 1 to plots. In order to obtain the index of elite political instability for each country, the scores for all events coded as explained above were added for the given period (1956-1989).

IV. *Statistical Model and Estimation Methods*

The impact of political instability on economic growth in sub-Saharan Africa shall be examined using a standard production function framework in which political instability is treated as an input similar to labor and capital (see, for example, Fosu, 1992). The equation to be estimated is of the form:

$$\dot{Q} = \alpha_0 + \beta_1 \dot{L} + \beta_2 \dot{K} + \beta_3 \dot{X} + \beta_4 PV + u1 \qquad (1)$$

where $\dot{Q}$ = average annual rate of growth of real gross domestic product

(GDP), $\dot{L}$ = average annual rate of growth of the labor force, $\dot{K}$ = growth rate of the capital stock, $\dot{X}$ = average annual rate of growth of exports of goods and services, PV = a measure of political instability; α_0 is the intercept term (expected to capture the effects of excluded variables, including technology), β_1, β_2, and β_3, denote the marginal productivity impacts of labor, capital, and exports, respectively; β_4 measures the impact of political instability on economic growth, when the inputs capital and labor are controlled for, and $u1$ is the stochastic disturbance term. The latter is assumed to be independently and identically distributed.

Several studies have used an augmented production-function model to show the independent impact of exports on economic growth. In these studies, exports are treated as a production input. The present model is based on the same augmented neoclassical production function and has been extended to incorporate a measure for political instability (Ram, 1985; Mbaku, 1989b; Fosu, 1992). Although exports (X) are not a production input in the usual sense, economic performance in a country is expected to be enhanced by export trade as a result of more efficient allocation of resources. Including exports as a regressor is designed to reflect those global factors that influence domestic productivity but are not captured by either K or L (see, for example, Fosu, 1990). If a country's export sector is dominated by manufacturing, the whole economy may benefit from the relatively advanced technologies usually associated with an industrialized sector (Keesing, 1967). Thus, the export sector may contribute indirectly to productivity improvements in the country's overall economic system (Fosu, 1990; Coppin, 1992).

In equation (1) PV is a measure for political instability. Its measurement was discussed earlier. Based on the discussion above, β_4, the coefficient of the measure of political instability is expected to be negative.

Some researchers have criticized the use of the growth rate in investment as a proxy for the rate of growth of the capital stock. Aware of this criticism, and following Ram (1985), I shall replace growth in investment with the investment-output ratio (I/Q). This is accomplished by replacing $\dot{K}$ in equation (1) by dK/Q, which is easily approximated by I/Q, so that equation (1) becomes:

$$\dot{Q} = \alpha_0 + \beta_1\dot{L} + \beta_2^*(I/Q) + \beta_3\dot{X} + \beta_4 PV + u2 \qquad (2)$$

Both equations (1) and (2) will be estimated and the estimate of β_4 and its direction will be used to determine the impact of political instability on economic growth in sub-Saharan Africa.

Measurement of Variables and Data Sources

1. *Dependent Variables*:

Economic growth. – Following other researchers, economic growth in this study will be measured by the rate of change of the real gross domestic product, 1980-1989. The data for this variable were obtained from World Bank (1991a).

2. *Independent Variables:*

Elite political instability. – In this study, it is indexed by coups d'état, attempted coups, and plots to overthrow the government. The measurement of this variable has been examined earlier. The data used in the construction of the index of elite political instability were obtained from McGowan (1986); and *African Research Bulletin* (1985/1986; 1986; 1987; 1988; 1989). Based on the earlier discussion, I expect elite political instability to impact economic growth and development negatively.

Labor. – The labor input is measured by the average annual rate of growth in the labor force, 1980-1986. The data for this variable are obtained from World Bank (1988).

Exports. – The variable exports is measured by the average annual rate of growth in exports, 1980-1989. The data for this variable are obtained from World Bank (1991a, 1991b).

Investment and investment-output ratio. – These variables are used to represent growth in the stock of capital. Growth in investment is measured for the period, 1980-1989, and the investment output ratio, I/Q is for 1989. Data on them are obtained from World Bank (1991a, 1991b).

Table 1 contains data on sample characteristics (means and standard

TABLE 1

SAMPLE CHARACTERISTICS:
MEANS AND STANDARD DEVIATIONS OF VARIABLES

Variable *	Mean	Standard Deviation
$\dot{Q}$	2.4971	2.3937
$\dot{L}$	2.3324	0.5855
$\dot{X}$	1.5794	4.6000
PV	19.2941	16.3661
$\dot{I}$	– 1.0882	7.3341
I/Q	17.5000	10.3375

* For a definition of variables, see Table 2.

deviations). As the information shows, the mean for the political instability measure was 19.2941. Of the 34 countries used in this study, 15 countries have elite political instability measures that are above this mean value.

This study will use OLS regression methods to test data for 34 countries in sub-Saharan Africa [1]. Despite the fact that some countries were eliminated because of missing data, the study still includes most of the countries in the sub-Saharan African region.

V. *Regression Results and Analysis*

The OLS regression results are reported in Table 2. The results are

TABLE 2

REGRESSION RESULTS OF POLITICAL INSTABILITY AND ECONOMIC GROWTH IN SUB-SAHARAN AFRICA, 1980-1989

(The dependent variable is rate of growth in real gross domestic product, $\dot{Q}$)

	Constant	$\dot{L}$	PV	$\dot{I}$	I/Q	$\dot{X}$	N	R^2	F
1	1.8949 (1.3359)	0.2999 (0.5434)	−0.0327 (−1.7081) *	—	—	0.338 (4.9045) **	34	0.5063	10.2571
2	2.6197 (5.4832) **	—	−0.0348 (−1.8753) *	—	—	0.3473 (5.2626) **	34	0.5015	15.5924
3	2.6340 (6.1266) **	—	−0.0274 (−1.6217) *	0.1095 (2.8789) **	—	0.3233 (5.3917) **	34	0.6894	15.6013
4	1.2316 (1.0447)	0.3875 (0.7785)	—	0.1169 (3.0036) **	—	0.3095 (4.8631) **	34	0.5836	14.0136
5	2.0382 (1.5936)	0.2464 (0.4954)	−0.0257 (−1.4762)	0.1088 (2.8215) **	—	0.3158 (5.0464) **	34	0.6127	11.4680
6	1.0058 (0.6455)	0.2884 (0.5287)	−0.0224 (−1.0916)	—	0.0425 (1.3078)	0.3212 (4.6354) **	34	0.5338	8.3026
7	1.6968 (2.0248) *	—	−0.0243 (−1.2197)	—	0.0427 (1.3326)	0.3301 (4.9675) **	34	0.5293	11.2471

NOTES. $\dot{Q}$ = average annual growth rate of real *GDP*; $\dot{L}$ = average annual growth rate of labor force; $\dot{I}$ = average annual growth rate of gross domestic investment; I/Q = average percent share of gross domestic investment in *GDP*; $\dot{X}$ = average annual growth rate of exports; PV = index of elite political instability.

** Significant at the 1 percent level.

* Significant at the 10 percent level.

[1] The countries used in the study include: Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Congo, Côte d'Ivoire, Ethiopia, Gabon, Ghana, Guinea, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, Sudan, Tanzania, Togo, Uganda, Zaire, Zambia, and Zimbabwe.

used to determine the effects of elite political instability on economic growth in sub-Saharan Africa. The elite political instability variable has a consistently negative and significant impact on economic growth in the region. As discussed earlier, political instability is regarded by many researchers as a significant constraint to economic growth and development in sub-Saharan Africa. Persistent institutional instability can significantly affect the productive capacity of an economy. Increased levels of institutional instability decrease the security of property rights, resulting in decreased savings and a lower stock of capital. In addition, political instability causes the flight of human capital (brain drain), depriving society of important resources for economic growth.

VI. *Summary and Conclusion*

The primary purpose of this study was to determine the effects of political instability on economic growth in sub-Saharan Africa. The results show that political instability has a negative impact on economic growth in the region. A significant part of the political instability that has become endemic to the region is caused by state intervention and economic planning. The regulatory activities of many sub-Saharan African governments create privileged positions for members of the politically-dominant groups, denying access to markets to the majority of the people. Since the existing institutional frameworks in these countries are not designed to respond to the people's demand for greater political and economic participation, locked-out individuals or groups must resort to violence in their struggle to gain access to markets.

This study shows that any attempt to improve economic performance in sub-Saharan Africa must begin with efforts to develop stable and sustainable political institutions. In order to ensure economic growth, sub-Saharan African countries must develop institutional frameworks that respond to the people's demand for increased participation in the development process. More responsive and stable institutions should reduce political instability, leading to an increase in savings and subsequently domestic capital formation.

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INSTABILITÀ ISTITUZIONALE E CRESCITA ECONOMICA NELL'AFRICA SUB-SAHARIANA

In più di trent'anni di indipendenza politica, pochi paesi dell'Africa subsahariana sono stati in grado di sviluppare sistemi di governo praticabili e durevoli. Molti paesi, al contrario, hanno raggiunto notevoli livelli di violenza politica. Dagli anni sessanta, il colpo di stato militare è diventato un importante metodo per cambiare un regime. In questo studio viene usato un modello econometrico basato sulla funzione di produzione neoclassica per esaminare l'impatto dell'instabilità politica sulla crescita economica nell'Africa sub-sahariana. I risultati mostrano che l'instabilità politica ha un rilevante effetto negativo sulla crescita economica della regione.

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GROWTH AND EXPORTS IN LDCs: A MULTIVARIATE TIME SERIES STUDY

by
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1. *Introduction*

The idea that export growth is a major determinant of general economic growth in an open economy is popular among economists [1]. As a rule, this idea is based on three theoretical arguments: First, export growth expands production by the foreign trade multiplier. Second, exports make foreign exchange available to import capital goods promoting economic growth. Third, the volume of and the competition on export markets result in economies of scale and an acceleration of technical progress. When we are only interested in explaining growth in industrialized countries, the first two arguments become very doubtful, and we are left with the possible supply side effect of export growth in the third argument. The first argument is based on a short-run Keynesian macro model which is clearly not able to explain long-run economic developments, whereas the second argument is not relevant for a country which is not rationed in international capital markets. However, a difference occurs when we are interested in explaining growth in Less Developed Countries (LDCs). To begin with, we may argue that an accelerated industrialization process has positive long-run effects on growth in LDCs. The low level of domestic demand may prevent such an industrialization process, and thus, this development has to be based on foreign demand and exports. Furthermore, the availability of foreign exchange by exports is, of course, important for countries which may

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[1] Indeed, the so-called export-led growth model pushes the importance of exports for growth to the extreme (see BECKERMAN, 1962; LAMFALUSSY, 1963; and BARRE, 1965, amongst others). For a recent appraisal of this model, the reader is referred to THIRLWALL (1986).

face credit rationing in international capital markets. Moreover, creditors consider export growth as an important indicator for the credit worthiness of a LDC.

The empirical assessment of the export-growth relationship mostly relies on country cross-section or, at best, on short time series [2]. Most studies found a clear positive correlation between the growth rates of exports and GDP or GNP [3] and interpreted this finding as empirical evidence for the relevance of exports in the growth process. However, these results do not imply that there exists a relationship between the long-run or trend development of exports and GNP or GDP, as they may arise from a purely short-run relationship. For this reason, one of the authors (Kugler, 1991) applied the recently developed multivariate cointegration methodology to test for common trends of GDP, consumption and investment on the one hand, and exports on the other hand. The data for six industrialized countries provided him with only very weak empirical evidence in favour of the importance of exports for growth, within this framework of analysis.

The aim of this paper is to present the results obtained by applying this approach to annual data over 1960-1989 for eleven LDCs, namely Argentina, Brazil, Chile, Egypt, Hong-Kong, Korea, Malaysia, Mexico, Pakistan, Philippines and Thailand.

2. *Method*

We apply multivariate cointegration analysis in order to test for the existence of long-run relationships between GDP, Consumption, Investment and Exports. For a more detailed discussion of this approach and its comparison with other methods for testing the importance of export for growth, the reader is referred to Kugler (1991). The logarithms of GDP, Consumption, Investment and Exports are collected in a vector Z_t:

$$Z_t' = [z_{1t}, z_{2t}, z_{3t}, z_{4t}] = [y_t, c_t, i_t, x_t]$$

We assume that the $p = 4$ elements of Z_t' are integrated of order one,

[2] See JUNG and MARSHALL (1985) for an extensive survey of previous studies.

[3] Considering a sample of countries with a relatively high level of income and an important manufacture sector, BALASSA (1978) finds a positive effect of exports on GNP of 4 to 5%. This conclusion is reiterated by TYLER (1981), who uses a sample of 55 countries with medium per capita level of income and finds that a 1% increase in exports increases by some 5% the GDP rate of growth. More recently, BROCHART (1985) considers a panel of 55 LDCs observed over 1962-1965 and in 1979, and confirms the positive effect of exports growth on income growth.

denoted by $I(1)$. This means that the changes in y_t, c_t, i_t and x_t, which are approximately growth rates, are stochastic variables, with a constant mean. The level of these variables may be linked by long-run or cointegrating relationships.

$$(1) \qquad \sum_{j=1}^{4} \beta_{ji} z_{jt} = \varepsilon_{it} \qquad i = 1, \ldots r$$

The ε_{it} are $I(0)$ series, although the z_{jt} are $I(1)$ variables. Given the $I(0)$ characteristic of ε_{it}, it is evident that the long-run behaviour of z_{jt} $(j = 1, \ldots 4)$ is determined by $4 - r$ common trends.

The one sector neoclassical growth model predicts [4] that y_t, c_t and i_t are driven by one common trend representing labour supply growth and technical progress. Thus, we have two cointegrating relationships under this model, namely, $c_t - y_t = \varepsilon_{1t}$ and $i_t - y_t = \varepsilon_{2t}$.

Hypotheses on the number of cointegrating relationships and certain linear restrictions on β_{ji} can be tested using the approach proposed by Johansen (1988) and Johansen and Juselius (1990). This method is based on a vector autoregressive representation of the level series:

$$(2) \qquad Z_t = \mu + \sum_{\tau=1}^{k} \pi_\tau Z_{t-\tau} + e_t$$

where e_t is $N(0, \Omega)$. It is useful to consider the following parametrization of equation (2):

$$(3) \qquad \Delta Z_t = \mu + \sum_{\tau=1}^{k-1} \Gamma_\tau \Delta Z_{t-\tau} + \Gamma_k Z_{t-k} + e_t$$

where $\Gamma_\tau = -I + \pi_1 + \ldots + \pi_\tau$.
The rank of Γ_k is equal to the number of cointegrating vectors. Thus, we can write this matrix as

$$(4) \qquad -\Gamma_k = \alpha\beta'$$

where β is the $p \times r$ matrix of cointegrating vectors and α is a corresponding coefficient matrix. It is easily seen that the $-\Gamma_k$ is the impact matrix determining the long-run multipliers in (3). Of course, if Z_t is $I(0)$, $-\Gamma_k$ can be inverted to get a stationary long-run equilibrium. According to (1), this corresponds to 4 cointegrating relationships.

The approach of Johansen is based on maximum likelihood estimation of (3). In this framework, we can test hypotheses for the number of cointegrating vectors r as well as certain linear restrictions for these cointegrating

[4] For a recent overview of the basic neoclassical growth model and its extensions, the reader is referred to KING, PLOSSER and REBELO (1988).

vectors. Thereby, we have to note that the matrix of cointegrating vectors β is not identified. However, the space spanned by the columns of β can be estimated. Thus, we can test whether β can be represented as a linear combination of at least r known vectors spanning a space of dimension p. In our context, we are mainly interested in whether export x_t can be excluded from the cointegrating relationships. This amounts to the following representation of β:

$$(5) \qquad \begin{bmatrix} \beta_{11} & \cdots & \beta_{1r} \\ \beta_{21} & \cdots & \beta_{2r} \\ \beta_{31} & \cdots & \beta_{3r} \\ \beta_{41} & \cdots & \beta_{4r} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix} \begin{bmatrix} \phi_{11} & \cdots & \phi_{1r} \\ \phi_{21} & \cdots & \phi_{2r} \\ \phi_{31} & \cdots & \phi_{3r} \end{bmatrix}$$

3. *Empirical Results*

The approach briefly outlined in the last section was applied to annual data for 11 developing or newly industrialized countries (Argentina, Brazil, Chile, Egypt, Hong-Kong, Korea, Malaysia, Mexico, Pakistan, Philippines and Thailand), covering the years 1960-1989. The data source is the World Bank World Tables. Consumption covers total private consumption expenditures, investment is business-fixed investment and exports cover goods and services. First of all, we have to test for the order of integration of the series involved. The results of augmented Dickey-Fuller unit root tests for the levels and first differences including constant and time trend are reported in Table 1. In general, the results indicate that the series are $I(1)$. For some first differences series, the unit root hypothesis cannot be rejected in the two lag augmented test. However, these results seem to be brought about by an over parametrization of the test, as the included additional difference term is not statistically significant at conventional levels.

Table 2 contains the results obtained by the application of Johansen's procedure [5].

Thereby, the lag length k of the level VAR system was determined by minimizing the Akaike Information Criterion AIC. Now, let us turn first to the test concerning the number of cointegrating vectors r. As a rule, the results support the existence of one or two cointegrating relations. The exception is Egypt for which no statistically significant cointegration rela-

[5] This analysis was performed using a RATS procedure kindly provided by Klaus Neusser of the University of Vienna.

TABLE 1

UNIVARIATE UNIT ROOT TESTS DICKEY-FULLER t-STATISTICS

$$\Delta z_t = \alpha + \beta t + \gamma z_t + \sum_{\tau=1}^{m} \theta_\tau \Delta z_{t-\tau} + \xi_t$$

Variable		Level		1st differences	
		$m = 1$	$m = 2$	$m = 1$	$m = 2$
Argentina	y	−1.22	−0.87	−5.68***	−3.50**
	c	−1.54	−1.01	−4.44***	−4.40***
	x	−3.35*	−2.24	−5.38***	−3.67**
	i	−0.98	−0.83	−4.14***	−2.84
Brazil	y	−0.34	−0.94	−3.49**	−4.30***
	c	−0.53	−0.77	−3.56**	−3.86**
	x	−4.01***	−2.75	−6.01***	−3.35*
	i	−1.38	−1.65	−3.15*	−3.07
Chile	y	−2.72	−2.97	−2.93	−2.33
	c	−3.22*	−3.49**	−3.13*	−2.82*
	x	−2.05	−2.24	−3.13*	−2.39
	i	−3.07	−2.33	−4.69***	−3.20*
Egypt	y	−2.82	−3.20*	−3.73**	−4.13***
	c	−2.34	−1.81	−4.62***	−2.63
	x	−3.11	−2.37	−3.83**	−2.82
	i	−2.54	−2.03	−3.16*	−2.34
Hong Kong	y	−3.46	−2.18	−5.60***	−2.83
	c	−1.74	−2.10	−4.18***	−2.56
	x	−2.14	−2.10	−3.76**	−1.99
	i	−2.30	−1.92	−3.89	−3.05
Korea	y	−2.27	−3.09	−3.71**	−2.95
	c	−2.13	−2.69	−3.18*	−2.19
	x	−2.10	−2.15	−5.57***	−3.51**
	i	−2.84	−3.21	−4.55***	−2.78
Malaysia	y	−1.53	−1.12	−3.71**	−2.45**
	c	−2.12	−1.82	−3.29*	−2.01***
	x	−1.19	−0.55	−5.42***	−3.57**
	i	−2.24	−1.75	−4.18***	−3.54
Mexico	y	−0.54	−0.58	−3.50**	−2.53
	c	−1.66	−1.66	−3.06	−2.03
	x	−2.57	−2.01	−5.27***	−3.08
	i	−0.61	−1.09	−4.72***	−3.40*
Pakistan	y	−1.78	−1.49	−3.30*	−2.43
	c	−3.70**	−2.26	−5.81**	−3.52**
	x	−1.41	−1.01	−4.72***	−2.41
	i	−1.96	−1.28	−6.70***	−5.35***
Philippines	y	−2.41	−1.33	−3.22*	−2.31
	c	−4.01***	−2.91	−4.75**	−3.73**
	x	−2.12	−2.01	−3.95***	−3.39*
	i	−2.26	−2.16	−2.65	−3.70**
Thailand	y	−2.93	−2.87	−2.28	−1.46
	c	−2.87	−2.74	−3.32*	−2.66
	x	−1.70	−2.04	−3.24*	−3.28*
	i	−3.00	−3.31*	−3.80**	−3.30*

*, ** and *** indicate significances at the 10%, 5% and 1% levels, respectively. Critical values are provided by FULLER (1976).

TABLE 2

MULTIVARIATE UNIT ROOT TESTS: JOHANSEN TEST FOR CO-INTEGRATION

$$\Delta Z_t = \mu + \sum_{\tau=1}^{k-1} \Gamma_\tau \Delta Z_{t-\tau} + \Gamma_k Z_{t-k} + e_t \qquad -\Gamma k = \Pi = \alpha\beta'$$

β: matrix of co-integration vectors

$$\beta = \begin{bmatrix} \beta_{11} & \dots & \beta_{1r} \\ \cdot & & \cdot \\ \cdot & & \cdot \\ \beta_{p1} & \dots & \beta_{pr} \end{bmatrix} \qquad \alpha = \begin{bmatrix} \alpha_{11} & \dots & \alpha_{1r} \\ \cdot & & \cdot \\ \cdot & & \cdot \\ \alpha_{p1} & \dots & \alpha_{pr} \end{bmatrix}$$

$Z_t = [y_t,\ c_t,\ x_t,\ i_t], p = 4$

Country	k	r	$H_0 : \Pi = \alpha\beta'$	$H_0 : \beta = H\phi$
			Johansen-Statistic[1]	$H = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$
			Value	χ^2_r [2]
Argentina	3	≤ 3	0.68	
		≤ 2	11.45*	61.0***
		≤ 1	40.89***	
		$= 0$	72.44***	
Brazil	2	≤ 3	3.34	
		≤ 2	9.93	
		≤ 1	18.20	5.07**
		$= 0$	43.98*	
Chile	2	≤ 3	0.45	
		≤ 2	7.48	
		≤ 1	21.81	4.12**
		$= 0$	45.69	
Egypt	2	≤ 3	0.39	
		≤ 2	9.19	
		≤ 1	22.75	1.84
		$= 0$	43.70	
Hong Kong	2	≤ 3	2.86	
		≤ 2	12.33	
		≤ 1	22.71***	6.56***
		$= 0$	62.24***	
Korea	2	≤ 3	0.56	
		≤ 2	13.06*	4.63*
		≤ 1	28.64***	4.55**
		$= 0$	53.85***	
Malaysia	3	≤ 3	0.44	
		≤ 2	13.02**	2.00
		≤ 1	30.73***	
		$= 0$	67.15***	
Mexico	2	≤ 3	0.26	
		≤ 2	9.44	
		≤ 1	22.88***	0.43
		$= 0$	54.97***	
Pakistan	3	≤ 3	0.70	
		≤ 2	4.32	
		≤ 1	24.36***	7.45***
		$= 0$	53.48***	
Philippines	3	≤ 3	0.25	
		≤ 2	3.94**	6.83***
		≤ 1	31.73***	
		$= 0$	64.32***	
Thailand	2	≤ 3	0.04	
		≤ 2	9.26	
		≤ 1	24.59**	2.59
		$= 0$	47.88**	

1) Under H_0, this statistic has a (non standard) distribution, which is tabulated in JOHANSEN and JUSELIUS (1990) (process with drift).

2) Under H_0, this statistc is χ^2 distributed with r degrees of freedom.

*, **, and *** indicate significances at the 10%, 5% and 1% levels, respectively.

tion is found. In this case, the existence of *any* trend relationship between the variables is doubtful. Second, consider the result of the hypothesis that exports can be excluded from the r cointegrating relations. This hypothesis must be rejected for seven out of 11 cases. For the four remaining countries, namely Egypt, Malaysia, Mexico and Thailand, there seems to be no common trend between exports, GDP, consumption and investment.

Thus, the majority of the countries considered are characterized by a common trend of exports and the other three macro economic variables. This finding supports the relevance of exports for growth in LDCs. This result may be understood as empirical evidence in favour of outward orientation against inward orientation as stressed by the World Bank in its Development Report 1987. By contrast, the corresponding analysis of six industrialized countries led to very weak evidence in favour of the importance of exports for growth. This pattern of results is in conformity with our theoretical presumptions. However, we may ask why we found no common trend of exports, GDP, consumption and investment for three newly industrialized countries (NICs), namely Malaysia, Mexico and Thailand. The two ASEAN NICs started their industrialization process in the late 70's. Since the strength of the positive effect of exports on development may depend on the share of manufactured products in total exports (Chen and Tang, 1990; Page, 1991; Chow, 1987), our sample may be too short to reflect the corresponding long-run relationship between exports and GDP, consumption and investment. By contrast to the ASEAN NICs, Mexico adopted an import substitution policy with a high degree of protection of domestic industries until the beginning of the 80's. The discovery of major oil reserves and the oil boom of the 70's created the financial means to increase manufactured imports and industrialize the domestic production in this country. Of course, the vulnerability of such a policy was revealed by the Mexican debt crisis of 1981-82, which in turn triggered off attempts to change the development policy [6].

4. *Summary and Conclusion*

The successful economic development of the so called newly industrialized countries (NICs) is mostly linked to their success on export markets. However, the empirical evidence from econometric tests of the relevance of

[6] For an overview of the different economic policies tried in Mexico since 1935, the reader is referred to CORDOSO and SANTIAGO (1988).

exports for economic growth is not convincing: the positive effects of exports on growth are obtained in the framework country cross sections or, at best, short time series, which does not allow to test for a long run relationship between exports and GDP or GNP.

In this paper, we applied, as Kugler (1991) did, the recently developed multivariate cointegration methodology to test for common trends of GDP, consumption and investment on the one hand and exports on the other hand.

The estimation results are available for eleven LDCs and the sample period 1960-1989 and lead to the following conclusions: contrary to the results obtained by Kugler (1991) for developed countries, the majority of countries in our sample (7 of 11) are characterized by a common trend of exports and the other macroeconomic variables. This finding stresses the catalytic role of exports for other sectors' growth in LDCs economies. In the case of the remaining four countries, namely Egypt, Malaysia, Mexico and Thailand, there seems to be no common trend between exports, GDP, consumption and investment. This could be attributed to the relatively small sample which may not reveal all long-run relationships. This problem is in particular relevant for Malaysia, Mexico and Thailand, which changed their development policy during the seventies or eighties in favour of promoting the competitiveness of their manufacturing sector in world markets. Thus, it would be interesting to analyse the common trend properties of manufacturing exports as well as GDP, investment and consumption.

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CRESCITA ED ESPORTAZIONI NEI PAESI IN VIA DI SVILUPPO: UNO STUDIO DI SERIE TEMPORALI MULTIVARIATE

Questo articolo analizza le proprietà delle tendenze comuni delle esportazioni da un lato e del PIL, consumo e investimento dall'altro, usando dati annuali di undici paesi in via di sviluppo. L'applicazione dell'analisi di cointegrazione multivariata di Johansen rileva nella maggior parte dei casi l'esistenza di una relazione di lungo periodo fra esportazioni e le altre tre variabili. Questo risultato indica l'importanza delle esportazioni per la crescita economica nei paesi in via di sviluppo.

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THE ENVIRONMENTAL CONSEQUENCES OF THIRD WORLD MILITARY EXPENDITURES AND ARMS PRODUCTION: THE LATIN AMERICAN CASE

by
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Introduction

This paper examines the pattern of linkages between military expenditures and environmental change. The analysis is focused on developing countries in general and Latin America in particular. The environmental impacts examined include those noted by Sivard: energy consumption, CO_2 emissions, and Greenhouse Gas Emissions [1].

The analysis attempts to determine the connections, if any, between the military sector and the environment. Several critical questions are examined. Do linkages exist through defense expenditures, or, instead, through arms production? What are the environmental implications for defense plant conversion and/or reduced defense expenditures? How do specific Latin America countries differ with regard to these defense/environmental issues? Are the patterns found in Latin America unique or are they typical of those found in other parts of the developing world?

Methodology

The first step in grappling with these questions was to determine

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[1] SIVARD (1991). Sivard also compiles a series for deforestation. However since this series covers only approximately one half of the developing countries, it was not included in this analysis.

whether and to what extent military expenditures and arms production are associated with other dimensions of development. For this purpose a sample of twenty measures of defense, socio-economic development and the environment were factor analyzed [2]. As Table 1 indicates, this exploratory analy-

TABLE 1

DEVELOPING COUNTRIES: ECONOMIC, MILITARY AND ENVIRONMENTAL TRENDS: EXPLORATORY FACTOR ANALYSIS (factor loadings)

Indicator	Factor			
	Factor 1 Size	Factor 2 Relative Shares	Factor 3 Urbanization	Factor 4 Energy/Growth
Co_2 Emissions	0.91 *	0.19	0.07	0.04
GNP	0.88 *	0.10	0.19	0.01
Arms Production	0.81 *	0.10	0.17	0.07
Population	0.79 *	− 0.08	− 0.20	0.14
Greenhouse Emissions	0.76 *	− 0.07	0.04	− 0.03
Environmental Index	0.60 *	0.59 *	0.15	− 0.06
Military Expenditures	0.58 *	0.55 *	− 0.02	0.11
Per Capita Military Exp.	− 0.07	0.92 *	0.00	0.08
Per Capita Energy Cons.	0.06	0.78 *	0.38	− 0.27
Per Capita Income	0.01	0.76 *	0.35	− 0.16
Military Burden	− 0.08	0.75 *	− 0.22	0.29
CO_2 per GDP	0.29	0.56 *	0.13	− 0.08
Industry / GDP	0.27	0.51 *	0.37	− 0.13
Urban Pop. Growth	− 0.24	0.09	− 0.81 *	0.11
Services / GDP	− 0.05	0.15	0.77 *	0.08
Urban Share Population	0.22	0.39	0.65 *	− 0.41
Greenhouse EM/GDP	0.06	− 0.21	− 0.46	− 0.29
GDP Growth	0.12	− 0.13	− 0.04	0.81 *
Energy Cons. Growth	0.10	0.33	− 0.16	0.66 *
Energy Prod. Growth	1.03	− 0.30	0.35	0.66 *
Eigen value	6.08	3.36	2.29	1.78

NOTES: Computations performed using a Varimax rotation. See *SPSS/PC + Statistics 4.0* (Chicago: SPSS Inc., 1990, pp. B125-B154) for a description of the methods used. Economic data from WORLD BANK (1990). Environmental and military expenditure data from SIVARD (1991). Arms production data from BRAUER (1991).

[2] An excellent description of this approach is given in RUMMEL (1970). The sample of countries consists of the 105 countries listed as developing in Sivard (included are several of the former Eastern Bloc countries such as Hungary, Poland, and Romania, as well as the western European countries of Ireland, Greece, Spain, and Portugal).

sis produced a key pattern: out of the twenty variables four major trends or dimensions were identified in the data set. Factor 1 reflects the overall size of the economy and military expenditures/arms production. Factor 2 consists of per capita income, several indices of the state of the environment, and the military burden (the share of defense expenditures in Gross National Product and per capita military expenditures). Factor 3 largely reflects the process of urbanization. Finally, Factor 4 depicts overall growth and the expansion of energy production and consumption.

In summary, this exploratory factor analysis suggests that a number of aspects of the environment are more closely associated with military expenditures and arms production than with such phenomenon as economic growth, urbanization or energy production and consumption.

As a first step in identifying the nature of the defense/environment association, a second factor analysis was performed. In this factor analysis defense and arms production variables were omitted from the data set. Here, the purpose was to create overall indices of the state of the environment: (a) the total amount of harmful emissions, and (b) the extent of emissions relative to population and Gross National Product. Clearly the advantage of summary indices of this type is that the results of subsequent analyses are not dependent on the choice of environmental measure since the summary indices are composite measures of the state of the environment.

As Table 2 suggests, the summary indices were best depicted by Factor 1 (consisting largely of population, total CO_2 emissions and greenhouse type emissions), and Factor 2 (comprised of energy consumption per capita, CO_2 per capita and Sivard's overall environmental index with higher values reflecting greater environmental degradation). Of these two factors, using Factor 2 has the advantage of eliminating any biases that might simply be associated with overall size, for example, a number of countries might have poor states of the environment in terms of total emissions and other measures simply because they are large both economically and demographically.

Table 2 indicates that several patterns typify Latin America. First, based on the relative environment dimension (Factor 2), only five of the twenty-one Latin American countries have greater than normal levels of environmental problems (Chile, Mexico, Argentina, Venezuela and Trinidad-Ecuador had a factor score of zero) [3]. Second, generally the Latin American countries also have lower than normal rates of urbanization (Factor 3) and energy production/consumption (Factor 4).

Using the country scores on Factor 2 as a measure of the environment,

[3] Factor scores are relative rankings of countries on that dimension, with the sample mean set at zero.

TABLE 2

DEVELOPING COUNTRIES: ECONOMIC, AND ENVIRONMENTAL TRENDS
(factor loadings)

Indicator	Factor			
	Factor 1 Total Emissions	Factor 2 Relative Emissions	Factor 3 Urbanization	Factor 4 Energy/Growth
Population	0.85 *	0.02	0.01	0.14
Co_2 Emissions	0.83 *	0.38	− 0.17	0.09
Greenhouse Emissions	0.79	0.01	− 0.06	0.02
Energy Cons. per Capita	− 0.08	0.84 *	− 0.19	− 0.19
Co_2 per GDP	0.18	0.81 *	0.05	− 0.01
Environmental Index	0.48	0.72 *	− 0.01	0.02
Urban Pop. Growth	− 0.08	− 0.16	0.89 *	0.06
Population Growth	− 0.13	0.09	0.88 *	0.03
Greenhouse EM/GDP	0.26	— 0.37	0.46	− 0.41
GDP Growth	0.14	− 0.16	0.05	0.79 *
Energy Cons. Growth	0.07	0.30	0.26	0.74 *
Energy Prod. Growth	0.05	− 0.24	− 0.18	0.69 *
Eigen Value	3.19	2.10	1.80	1.53
Factor Scores				
Haiti	− 0.63	− 1.10	− 0.84	− 0.26
Bolivia	− 0.22	− 0.34	− 0.13	− 1.31
Dominican Republic	− 0.51	− 0.30	− 0.28	0.13
Honduras	− 0.36	− 0.59	0.63	0.09
Guatemala	− 0.33	− 0.67	− 0.51	− 0.56
El Salvador	− 0.55	− 0.84	− 1.40	− 0.36
Jamaica	− 0.52	− 0.14	− 1.22	− 0.84
Ecuador	0.08	0.00	0.35	− 0.94
Colombia	0.56	− 0.01	− 0.38	0.08
Paraguay	− 0.46	− 0.55	0.15	0.58
Peru	− 0.08	− 0.26	− 0.62	− 0.60
Chile	− 0.32	0.11	− 0.99	− 0.11
Costa Rica	− 0.23	− 0.62	− 0.60	− 0.01
Mexico	1.46	1.08	− 0.58	− 0.62
Panama	− 0.64	− 0.15	− 0.70	0.51
Brazil	4.17	− 0.75	− 0.23	− 0.29
Nicaragua	− 0.02	− 0.55	0.70	− 1.04
Uruguay	− 0.47	− 0.89	− 2.18	− 0.56
Argentina	0.27	0.74	− 1.20	− 0.49
Venezuela	0.00	1.42	− 0.31	− 0.54
Trinidad	− 0.96	2.72	− 0.58	− 2.00

NOTES: See Table 1.

the next step in the analysis was to determine the extent to which environmental degradation was associated with defense. For this purpose a simple model was estimated of the form:

$$\text{Factor 2} = f[Y/P,\ I/Y,\ ME/Y]$$

Where:

Factor 2 = country scores on Factor 2 (relative environment)
Y/P = per capita income (1988)
I/Y = the share of industrial output in GDP (1988)
ME/Y = the share of defense expenditures in GDP (1988)

Since environmental problems are likely to increase with per capita income and industrial production, these variables are used as control variables. That is, after accounting for their effects, are there any additional environmental problems that can be attributed to defense expenditures?

The regression results presented in Table 3 yield five patterns. First, for the whole sample, all three variables are statistically significant in accounting for environmental differences across countries (see Table 3, equation 1). These three variables account for nearly sixty percent of the variations in relative environments of our sample countries. Second, nevertheless by examining individually those groups of countries below and above the environmental norm contrasting findings were produced. For the countries with relatively low environmental problems (Factor 2 scores less than zero, see Table 3, equation 2), differences in the relative degree of industrial development was the only factor associated with variations in the environment. Third, for countries with relatively high levels of environmental problems (Factor 2 scores greater than zero, see Table 3, equation 7) only per capita income was significant in accounting for differences in the environment. Fourth, starting with the group of countries with low level of environmental problems and incrementally adding countries with Factor 2 scores greater than zero (Table 3, equations 3, 4, 5 and 6) produced a pattern in which first defense expenditures became statistically significant (equation 3) and then per capita income (Equation 6). Finally, a similar result was obtained by starting with the group of countries with relatively high levels of environmental problems (those with Factor 2 scores greater than zero) and incrementally adding groups of countries with relatively lower environmental difficulties – those with Factor 2 scores having progressively larger negative signs. As countries with factors scores less than zero were added, the defense burden became statistically significant in accounting for environ-

TABLE 3

ANALYSIS OF ENVIRONMENTAL PATTERNS
(standardized regression coefficients)

Regression Results: Total Sample				
(1) Factor 2=	0.41 *Y/P* +	0.33 *ME/Y* +	0.31 *I/Y*	
	(4.42)	(4.19)	(3.45)	r_2 (adj) = 0.591; df = 66
Country Grouping: Factor 2 < 0				
(2) Factor 2 =	0,36 *I/Y*			
	(2.51)			r_2 (adj) = 0.111; df = 42
Country Grouping: Factor 2 < 0.25				
(3) Factor 2 =	0.40 *I/Y* +	0.35 *ME/Y*		
	(3.06)	(2.73)		r_2 (adj) = 0.225; df = 45
Country Grouping: Factor 2 < 0.50				
(4) Factor 2 =	0.42 *Y/P* +	0.36 *ME/Y* +	0.28 *IY*	
	(3.60)	(3.26)	(2.34)	r_2 (adj) = 0.396; df = 47
Country Grouping: Factor 2 < 0.75				
(5) Factor 2 =	0.40 *Y/P* +	0.40 *ME/Y* +	0.35 *I/Y*	
	(3.77)	(4.13)	(3.27)	r_2 (adj) = 0.520; df = 0.52
Country Grouping: Factor 2 < 1.0				
(6) Factor 2 =	0.40 *I/Y* +	0.45 *ME/Y* +	0.28 *Y/P*	
	(3.90)	(4.79)	(2.77)	r_2 (adj) = 0.478; df = 0.56
Country Grouping: Factor 2 > 0				
(7) Factor 2 =	0.53 *Y/P*			
	(3.08)			r_2 (adj) = 0.253; df = 24
Country Grouping: Factor 2 > −0.25				
(8) Factor 2 =	0.57 *Y/P* +	0.30 *ME/Y*		
	(4.32)	(2.28)		r_2 (adj) = 0.428; df = 32
Country Grouping: Factor 2 > −0.50				
(9) Factor 2 =	0.60 *Y/P* +	0.29 *ME/Y*		
	(5.38)	(2.58)		r_2 (adj) = 0.476; df = 42
Country Grouping: Factor 2 > −0.75				
(10) Factor 2 =	0.45 *Y/P* +	0.31 *ME/Y* +	0.27 *I/Y*	
	(4.16)	(3.29)	(2.58)	r_2 (adj) = 0.559; df = 49
Country Grouping: Factor 2 > −1.0				
(11) Factor 2 =	0.43 *Y/P* +	0.32 *ME/Y* +	0.30 *I/Y*	
	(4.41)	(3.79)	(3.11)	r_2 (adj) = 0.601; df = 60

NOTES: Equations estimated using ordinary least squares estimation procedure. ( ) *t* test of significance; r_2 (adj) = the adjusted coefficient of determination; df = degrees of freedom.

mental differences (Table 3, equation 8), followed by the share of industrial output in GDP (Table 3, equation 10).

The five patterns identified above suggest that countries with low levels of environmental problems tend to have increases in environmental problems associated with expanded share of industrial production in total output. Beyond some point, higher levels of environmental problems are associated with expanded defense burdens. Finally, high levels of environmental difficulties can be attributed exclusively to relative affluence (as measured by per capita income).

These patterns also indicate that developing countries are far from homogeneous: there may be several distinct environments in which the same dollar value of military expenditures will yield significantly different patterns of environmental impact. One possibility is that these varying impacts are in part associated with the relative development of arms industries and the composition of the industrial base that supports these industries. A recent data set developed by Brauer was used to examine this possibility [4]. Brauer develops a Pontential Defense Capacity (PDC) index based on the extent of domestic industries relevant for arms production. These include industrial and other chemicals (to account for the production potential for explosives and chemical weapons), iron and steel, non-ferrous metals, metal products, electrical and non-electrical machinery, and transportation equipment [5].

Using Brauer's data on LDC arms production in ISIC categories [6], the next step in the analysis was to determine the extent to which arms production and the composition of the industrial base could be used to split our sample of countries into sub categories reflecting the relative level of environmental problems. Discriminant analysis was used for this purpose [7].

Initially, countries were arbitrarily classified based on their Factor 2 environmental score. Based on the impact of defense expenditures on the regression results (see Table 3 above) three groups were arbitrarily selected: (a) those with Factor 2 scores less than zero, that is, those with low level of environmental problems; (b) those with Factor 2 scores greater than zero but less than one, that is, countries with moderate environmental difficulties; and (c) those with Factor 2 scores greater than one, that is, countries with

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[4] BRAUER (1991).

[5] BRAUER (*op. cit.*, p. 176).

[6] BRAUER (*op. cit.*, Table 3, p. 169).

[7] For a good over-view of this procedure see: KACHIGAN (1986, ch. 14). The actual computations were made using *SPSS/PC+ Version 4*. See *SPSS/PC+ Advanced Statistics 4.0* (Chicago: SPSS Inc., 1990, pp. B1-B38) for a description of the program.

high levels of emissions and other adverse environmental indicators. The variables entered in the step-wise selection process as potential discriminating variables included: (1) per capita income, (2) Brauer's arms production potential (PDC); (3) the share of defense expenditures in GNP – the military burden; and (4) the relative industrial production as measured by the three digit ISIC codes-351, 352, 371, 372, 381, 382, 383, 384, and 385 [8]. Ten

TABLE 4

DISCRIMINANT MODEL I: GROUPING OF COUNTRIES BY PER CAPITA INCOME, INDUSTRIAL STRUCTURE, DEFENSE EXPENDITURES, AND ARMS PRODUCTION

Step	Entered	Wilks' Lambda	Variable Name
1	*Y/P*	0.623	Per capita Income
2	*PDC*	0.478	Arms Production Capacity
3	*ISIC352*	0.387	Other chemical products
4	*ME/Y*	0.325	Defense burden
5	*ISIC371*	0.276	Iron and Steel
6	*ISIC382*	0.225	Non-electrical machinery
7	*ISIC384*	0.195	Transport equipment
8	*ISIC385*	0.175	Scientific equipment
9	*ISIC351*	0.153	Industrial chemicals
10	*ISIC* TOTAL	0.148	Total ISIC score

Membership Actual Group	Number of Cases	Predicted Group		
		Group 1	Group 2	Group 3
Group 1	45	42 (93.3%)	3	0
Group 2	18	5	11 (61.1%)	2
Group 3	10	1	0	9 (90.0%)

NOTES: Results based on step-wise discriminant analysis using *SPSS/PC + Statistical Package*. See: *SPSS/PC + Advanced Statistics* (Chicago: Spss Ins., 1990, pp. B1-B39) for a description of the procedure followed. The initial groupings for analysis were: Group 1, Table 2, Factor 2 scores less than zero; Group 2, Factor 2 scores greater than zero, but less than one; Factor 3 scores greater than one.

[8] See Brauer's Table 3. It was assumed that non-arms producing countries had zero for all of the ISIC codes examined here.

variables were found to be statistically significant in differentiating countries into three groups (see Table 4) [9].

As Table 4 indicates, the most important variable in distinguishing groups was per capita income, followed by arms protection potential, the relative development of other chemical products industries (ISIC 352), the military burden, and finally a series of industrial groupings. On the basis of the initial *a priori* groupings, these variables also grouped 42 of the 45 Group 1 countries in Group 1, 11 of the 18 Group 2 countries in Group 2, and 9 of the Group 3 countries in Group 3. In other words, these discriminating variables produced groupings with a very high degree of overlap with those created on the basis of relative environmental conditions.

In terms of the characteristics of the three groups *Group 1* countries tend to be poorer in terms of per capita income. They also have the smallest share of industry in GDP, and military expenditures in GNP. They are not likely to be arms producers. These countries generally rank quite low in terms of development of industries in the ISIC codes examined. *Group 2* countries have the highest arms production capability, although not the largest share of industry in GDP. They also have by far the greatest military burdens. This group of countries also has the greatest number of military related industries in most of the relevant ISIC industrial codes. *Group 3* countries appear to be the most affluent. They have by far the highest per capita income. They also have the highest share of industry in GDP. However, they are second to Group 2 countries in terms of industries in most of the ISIC industrial codes. (See Table 5).

The Latin American countries were classified with a high degree of probability in the groups originally assigned. However there were a few notable exceptions: Peru and Brazil were placed in Group 2 after being initially classified in Group 1; Argentina was classified as a Group 3 country in contrast to its initial Group 2 classification; and Trinidad was placed in Group 1, after being initially classified as a Group 3 country. Generally, the remaining countries in the region conformed very well to the groupings anticipated from Factor 2 scores.

Table 6 indicates the regressions performed on each group. Table 6 reveals that generally the results using the new groups were similar to those presented in Table 3. First, Group 1 countries experienced increased environmental problems associated with increases in their per capita income and increased share of industry in total output. Second, environmental problems in Group 2 countries were strictly related to increased defense

[9] On the basis of the F test of statistical significance of inclusion.

TABLE 5

DISCRIMINANT MODEL I:
STRUCTURAL DIFFERENCES BY GROUP (means)

	Variable Group		
	1	2	3
Y/P (per capita income)	725.68	2330.67	5420.00
I/Y (share of industry in GDP)	25.91	35.07	41.30
AP (level of arms production)	0.25	1.13	1.20
ISIC (total)	9.80	71.20	49.60
ME/Y (military expenditures/GDP)	2.81	7.52	4.04
ISIS351 (industrial chemicals)	2.63	21.20	14.50
ISIC352 (other chemical products)	0.64	3.93	2.20
ISIC371 (iron and steel)	1.02	8.73	8.90
ISIC372 (non-ferrous metal)	1.27	8.67	6.20
ISIC381 (fabricated metal products)	0.43	2.47	1.30
ISIC382 (non-electrical machinery)	1.52	12.20	6.60
ISIC383 (electrical machinery)	1.12	7.40	5.20
ISIC384 (transport equipment)	0.89	5.87	4.40
ISIC385 (scientific equipment)	0.15	0.67	1.30

	Discriminant Score	Initial Grouping	Probability of Placement		
			Group 1	Group 2	Group 3
Haiti	− 1.52	1.0	96.8	3.2	0.0
Bolivia	− 0.86	1.0	88.6	11.4	0.0
Dominican Republic	− 2.89	1.0	93.2	6.8	0.0
Honduras	− 0.67	1.0	85.7	14.3	0.0
Guatemala	− 1.19	1.0	95.1	4.9	0.0
El Salvador	− 0.82	1.0	89.7	10.3	0.0
Jamaica	− 1.25	1.0	96.0	4.0	0.0
Ecuador	− 1.03	1.0	93.9	6.1	0.0
Colombia	− 1.23	1.0	96.1	3.9	0.0
Paraguay	− 1.18	1.0	95.6	4.3	0.0
Peru	0.90	1.0	23.4 *	76.0	0.6
Chile	− 1.16	2.0	4.8	95.2	0.0
Costa Rica	− 1.02	1.0	95.3	4.7	0.0
Mexico	5.12	3.0	0.0	0.0	100.0
Panama	− 0.58	1.0	90.6	9.4	0.0
Brazil	− 1.25	1.0	44.5 *	55.5	0.0
Nicaragua	–	1.0	–	–	–
Uruguay	− 0.39	1.0	88.5	11.5	0.0
Argentina	3.29	2.0	0.0	6.3	93.7 *
Venezuela	− 3.48	3.0	0.0	0.1	99.9
Trinidad	− 0.17	3.0	88.1	11.9	0.0 *

NOTES: Based on the analysis in Table 4.

burdens. Third, Group 3 countries experienced increased levels of emissions and other environmentally adverse outputs as their per capita incomes increased. Fourth, combining Groups 1 and 2 resulted in all three variables

TABLE 6

ANALYSIS OF ENVIRONMENT: DESCRIMINANT MODEL I
(standardized regression coefficients)

Regression Results: Group 1	
Factor 2 = 0.43 *Y/P* + 0.25 *I/Y*	
(3.21) (1.84) *	r_2 (adj) = 0.323; df = 44
Regression Results: Group 2	
Factor 2 = 0.66 *MEY*	
(2.74)	r_2 (adj) = 0.371; df = 10
Regression Results: Group 3	
Factor 2 = 0.75 *Y/P*	
(3.16)	r_2(adj) = 0.500; df = 8
Regression Results: Groups 1 and 2	
Factor 2 = 0.33 *Y/P* + 0.34 *ME/Y* + 0.31 *I/Y*	
(2.89) (3.12) (2.43)	r_2 (adj) = 0.333; df = 55
Regression Results: Groups 2 and 3	
Factor 2 = 0.58 *Y/P* + 0.39 *ME/Y*	
(3.68) (2.49)	r_2 (adj) = 0.489; df = 19

Residuals-Total Sample

	Actual	Predicted	Residual
Haiti	− 1.01	− 0.22	− 0.78
Bolivia	− 0.34	− 0.21	− 0.13
Dominican Republic	− 0.30	− 0.30	0.00
Honduras	− 0.59	− 0.30	− 0.29
Guatemala	− 0.68	–	–
El Salvador	− 0.85	− 0.36	− 0.49
Jamaica	− 0.14	− 0.04	− 0.10
Ecuador	− 0.01	− 0.10	0.10
Colombia	− 0.01	− 0.26	0.25
Paraguay	− 0.55	− 0.48	− 0.07
Peru	− 0.26	0.17	− 0.44
Chile	0.11	–	–
Costa Rica	− 0.61	− 0.36	− 0.26
Mexico	1.08	− 0.18	1.26
Panama	− 0.16	− 0.44	0.29
Brazil	− 0.76	0.16	− 0.91
Nicaragua	–	–	–
Uruguay	− 0.89	− 0.09	− 0.81
Argentina	0.74	0.28	0.46
Venezuela	1.41	0.23	1.19
Trinidad	2.72	0.09	2.71 *

NOTES: See Table 3.

– per capita income, industrial share, and defense burden – becoming statistically significant. Finally combining Groups 2 and 3 yielded a pattern whereby per capita income, the defense burden, and defense expenditures were statistically significant.

While these results are consistent with those presented above, the overall coefficients of determination (r_2) are somewhat low. Because of the seeming importance of defense expenditures and arms production in affecting environmental conditions in the mid-range of sample countries, a second discriminant analysis was performed. As before, the variables were added in a step-wise fashion and included on the basis of their F statistic. This time, however, the analysis omitted per capita income (Y/P) and the industrial share of GDP (I/Y). When this was done, eight variables were statistically

TABLE 7

DISCRIMINANT MODEL II: GROUPING OF COUNTRIES BY ARMS PRODUCTION, DEFENSE EXPENDITURES, AND INDUSTRIAL STRUCTURE

Step	Entered	Wilks' Lambda	Variable Name
1	*API352*	0.729	Other chemical products
2	*ME/Y*	0.585	Military burden
3	*API371*	0.462	Iron and steel
4	*API382*	0.400	Non-electrical machinery
5	*API385*	0.376	Scientific equipment
6	*API384*	0.355	Transport equipment
7	*API351*	0.329	Industrial chemicals
8	*APIT*	0.316	Total industry
9			

Membership Actual Group	Number of Cases	Predicted Group		
		Group 1	Group 2	Group 3
Group 1	47	42 (89.4%)	4	1
Group 2	18	5	10 (55.6%)	3
Group 3	10	3	0	7 (70.0%)

NOTES: See Table 4.

significant in delineating three groups and of these, defense burden was the second most important (see Table 7).

As Table 8 indicates, these groups had some of the same characteristics as those formed in the first discriminant exercise. Group 1 is composed largely of low income non-arms producers. Group 3 countries now have the

TABLE 8

DEFENSE PRODUCTION/EXPENDITURE DIFFERENCES BY GROUP (means)

	Variable Group		
	1	2	3
AP (level of arms production)	0.23	1.33	1.11
APIT (total arms production)	9.17	66.50	49.60
ME/Y (military expenditures/GNP)	3.14	5.76	7.52
*API*351 (industrial chemicals)	2.47	19.44	14.50
*API*352 (other chemical products)	0.60	4.00	2.20
*API*371 (iron and steel)	0.96	8.17	8.90
*API*372 (non-ferrous metal)	1.19	7.78	2.39
*API*381 (fabricated metal products)	0.40	2.39	1.30
*API*382 (non-electrical machinery)	1.42	10.78	6.60
*API*383 (electrical machinery)	1.15	7.22	5.20
*API*384 (transport equipment)	0.83	5.61	4.40
*API*385 (scientific equipment)	0.15	0.56	1.30

	Discriminant Initial		Probability of Placement		
	Score	Grouping	Group 1	Group 2	Group 3
Haiti	− 1.12	1.0	93.8	5.4	0.8
Bolivia	− 0.51	1.0	84.9	11.5	4.6
Dominican Republic	− 1.39	1.0	63.1	36.9	0.0
Hounduras	− 0.46	1.0	83.7	12.2	4.1
Guatemala	− 1.04	1.0	93.0	6.1	0.9
El Salvador	− 0.65	1.0	88.7	9.7	2.5
Jamaica	− 1.18	1.0	94.3	5.0	0.7
Ecuador	− 0.98	1.0	92.4	6.5	1.1
Colombia	− 1.21	1.0	94.6	4.8	0.6
Paraguay	− 1.16	1.0	94.1	5.2	0.7
Peru	0.40	1.0	25.5 *	71.2	3.3
Chile	0.69	2.0	0.8	99.2	0.0
Costa Rica	− 1.26	1.0	94.9	4.6	0.6
Mexico	3.15	3.0	0.0	0.0	100.0
Panama	− 1.00	1.0	92.6	6.4	1.0
Brazil	− 0.15	1.0	36.9 *	62.2	0.9
Nicaragua	2.27	1.0	1.4 *	8.9	89.7
Uruguay	− 0.98	1.0	92.4	6.5	1.1
Argentina	3.21	2.0	0.2	6.6 *	93.2
Venezuela	1.83	3.0	2.6	4.1	93.3
Trinidad	− 1.18	3.0	94.3	5.0	0.7 *

NOTE: Based on results in Table 7.

TABLE 9

ANALYSIS OF ENVIRONMENT: DISCRIMINANT MODEL II
(standardized regression coefficients)

Step-wise Analysis with *Y/P, I/Y, ME/Y* and SCORE1 (the first discriminant function, see Table 9)

Regression Results: Groups 1, 2 and 3
Factor 2 = 0.46 *Y/P* + 0.40 *SCORE*1 + 0.20 *I/Y*
(5.29) (5.08) (2.18) r_2 (adj) = 0.652; df = 62

Regression Results: Group 1
Factor 2 = 0.61 *Y/P* + 0.26 *I/Y*
(5.51) (2.37) r_2 (adj) = 0.596; df = 44

Regression Results: Groups 1 and 2
Factor 2 = 0.57 *Y/P* + 0.27 *I/Y*
(5.34) (2.58) r_2 = 0.544; df = 54

Regressions Results: Groups 2 and 3
Factor 2 = 0.62 *SCORE*1 + 0.48 *ME/Y*
(4.66) (3.60) r_2 = 0.691; df = 16

Latin American Countries in Groups 2 and 3 Residuals From Regressions of Groups 2 and 3

	Actual	Predicted	Residual
Peru	− 0.26	0.16	− 0.42
Chile	0.11	0.16	− 0.05
Mexico	1.08	0.94	0.14
Brazil	− 0.76	− 0.34	− 0.42
Nicaragua	− 0.54	1.93	− 2.48
Argentina	0.74	1.05	− 0.31
Venezuela	1.42	0.54	0.88

Latin American Countries in Groups 2 and 3 Residuals From Regressions of Total Sample (Groups 1, 2 and 3)

	Actual	Predicted	Residual
Peru	− 0.26	0.17	− 0.43
Chile	0.11	–	–
Mexico	1.08	1.05	0.03
Brazil	− 0.76	0.27	− 1.03
Nicaragua	− 0.54	–	–
Argentina	0.74	1.36	− 0.63
Venezuela	1.42	0.94	0.48

Latin American Countries in Group 2 Residuals From Regressions of Groups 1 and 2

	Actual	Predicted	Residual
Peru	− 0.26	− 0.13	− 0.13
Chile	0.11	–	–

TABLE 9 (contd.)
ANALYSIS OF ENVIRONMENT: DISCRIMINANT MODEL II

Latin American Countries in Group 1 Residuals From Regressions of Group 1 and 2	Actual	Predicted	Residual
Haiti	− 1.01	− 0.25	− 0.75
Bolivia	− 0.34	− 0.44	0.11
Dominican Republic	− 0.30	− 0.27	− 0.02
Honduras	− 0.59	− 0.51	− 0.07
Guatemala	− 0.68	−	−
El Salvador	− 0.85	− 0.48	− 0.36
Jamaica	− 0.14	− 0.04	− 0.10
Ecuador	− 0.01	− 0.16	0.16
Colombia	− 0.01	− 0.16	0.19
Paraguay	− 0.55	− 0.37	− 0.17
Costa Rica	− 0.61	− 0.22	− 0.39
Panama	− 0.16	− 0.35	0.20
Uruguay	− 0.89	− 0.06	− 0.83
Trinidad	2.72	0.13	2.59
Latin American Countries in Group 1 Residuals From Regressions of Group 1	Actual	Predicted	Residual
Haiti	− 1.01	− 0.29	− 0.71
Bolivia	− 0.34	− 0.48	0.14
Dominican Republic	− 0.30	− 0.31	− 0.01
Honduras	− 0.59	− 0.54	− 0.05
Guatemala	− 0.68	−	−
El Salvador	− 0.85	− 0.50	− 0.34
Jamaica	− 0.14	− 0.07	− 0.06
Ecuador	− 0.01	− 0.19	0.18
Colombia	− 0.01	− 0.22	0.21
Paraguay	− 0.55	− 0.40	− 0.15
Costa Rica	− 0.61	− 0.24	− 0.38
Panama	− 0.16	− 0.35	0.19
Uruguay	− 0.89	− 0.06	− 0.83
Trinidad	2.72	0.15	2.57

NOTES: See Table 6.

highest defense burdens and Group 2 countries have the highest number of many of the industries necessary for arms production. Again Peru, Brazil, Argentina and Trinidad changed groups. Nicaragua was added to the sample (it had been omitted previously due to the lack of data on its industrial share of GDP) and it too changed groups (from Gourp 1 based on environment to Group 3 based on the discriminating variables).

Using these new groups as the basis for analysis of environmental conditions, a new variable, SCORE1, was added to the regression analysis. SCORE1 is the discriminant score formed in the Discriminant II analysis

(see Table 7). Based on the variables forming the three groups, SCORE1 can be interpreted as a measure of the relative degree of development of those industries critical for the successful development of indigenous arms industries. As with the Factor scores noted earlier, this is a standardized variable with a mean of zero. Values greater than one signify above average development of an industrial structure capable of supporting arms industries, while negative scores signify the relative lack of this type of industrialization.

As Table 9 indicates, including this variable in the regression analysis produced several interesting results. First, generally the sub-groupings had dramatically improved coefficients of determination. Also there was a general reduction in the estimated residual (actual minus predicted values of Factor 2) for the Latin American countries. Second, for the combined three groups, per capita income, the discriminant score, and the share of industry in GDP were all statistically significant. The overall coefficient of determination improved slightly to over 65 percent. Third, looking at countries in Group 1, again per capita income and the share of industry were the only variables statistically significant in accounting for differences in the environment. However this time the coefficient of determination was nearly double that of the previous analysis (see Table 7). Finally, Groups 1 and 2 combined yielded the same pattern as Group 1 individually. However examining Groups 2 and 3 as a combined set produced a coefficient of determination of nearly 70 percent. For these countries, the discriminant score and the defense burden were highly significant in reducing the level of environmental quality.

Conclusions

This analysis has shown a clear link between military expenditures, arms production, and the environmental quality of our sample countries. After accounting for such factors as per capita income, then industrial structure, military expenditures and the industrial structures associated with successful arms production often account for a large share of the differences in environmental quality between countries.

It is clear that the patterns of environment and defense in Latin America are similar to those found in other parts of the world. It should be noted, however, that the majority of Latin American countries (as well as developing countries as a whole – classified here as Group 1 countries) usually do not have environmental difficulties that can be linked directly to

defense expenditures and/or arms production. For these countries, the main sources of environmental problems seem to be increased industrial shares in total output together with per capita income. The scope for improving the environment in these countries through converting defense plants to civilian industries is either non-existent or extremely limited.

On the other hand, there is a group of countries with higher levels of income, defense production, and military expenditures that could possibly obtain significant environmental benefits through defense plant conversion. Generally these countries have a structure whereby increased industrial output *per se* does not contribute to declining environmental quality. They are countries where many of their environmental problems are linked either to defense expenditures or to an industrial structure having a substantial number of industries upon which arms production could either be undertaken or is already underway. These countries include Mexico, Peru, Chile, Brazil, Argentina and Venezuela. For this group of economies there is scope to shift resources from defense and defense related production to general industrial activity. In the process they would experience an improvement in their environmental conditions.

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CONSEGUENZE AMBIENTALI DELLE SPESE MILITARI DEL TERZO MONDO E PRODUZIONE DI ARMI: IL CASO DELL'AMERICA LATINA

Lo scopo di questo articolo è di esaminare il tipo di connessioni tra spese militari e cambiamento ambientale. L'analisi si concentra sui paesi in via di sviluppo in generale e la regione latino-americana in particolare. Il risultato principale è la identificazione di una chiara connessione fra spese militari, produzione di armi e qualità ambientale. Cioè dopo aver tenuto conto di fattori quali il reddi-

to procapite, la struttura industriale, le spese militari e le strutture industriali associate a una redditizia produzione di armi sono spesso responsabili di gran parte delle differenze nelle qualità ambientali tra un paese e l'altro.

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BARRIERE MULTIPLE ALL'ENTRATA IN UNO SCHEMA SIMMETRICO

di
PAOLO COCCORESE *

1. *Introduzione*

La recente letteratura riguardante la teoria dell'organizzazione industriale tende a richiamare sempre più l'attenzione sui fattori che non consentono il raggiungimento di un equilibrio concorrenziale in un mercato, e segnatamente sulle barriere strategiche all'entrata. Tuttavia l'approccio dominante generalmente assegna all'impresa già operante sul mercato la possibilità di usare una sola variabile strategica al fine di scoraggiare l'entrata di concorrenti, trascurando perciò l'ipotesi di ricorrere a più strumenti per favorire il raggiungimento dell'obiettivo della *entry deterrence*.

Uno dei primi tentativi di discostarsi dall'impostazione tradizionale si trova in Delbono (1987), in cui viene considerato l'uso combinato di due variabili strategiche, ovvero la capacità produttiva e la spese in R&S; tuttavia, come rileva lo stesso autore, entrambi gli strumenti sono dello stesso tipo, nel senso che vanno ad agire sul lato dei costi, e per questo motivo l'efficacia del loro impiego congiunto è piuttosto circoscritta [1].

Come è noto, fra i tipi di barriere all'entrata, Bain (1956) considera anche quelle derivanti dalla differenziazione del prodotto (operanti perciò dal lato della domanda); Panunzi (1989) ha dunque costruito un modello in cui si suppone l'impiego di barriere multiple che agiscono sia sui costi sia sulla domanda (in particolare, capacità produttiva e differenziazione del

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[1] Cfr. DELBONO (1987, p. 52).

prodotto), le quali si rivelano di decisiva importanza quando la dimensione del mercato è « grande » rispetto ai costi (in un senso che sarà chiaro più avanti).

Nell'impostazione dei modelli analitici riguardanti le barriere all'entrata, tuttavia, i comportamenti dell'incumbent e del concorrente molto spesso sono stati esplicitati assegnando al primo un vantaggio eccessivo, consistente principalmente nel consentirgli di porre in essere azioni non accessibili al proprio avversario. Così, alla condizione di impresa established si è venuta ad aggiungere un'ulteriore asimmetria nei comportamenti a favore del produttore, che ha accresciuto il suo vantaggio strategico.

L'obiettivo che ci si pone in questo lavoro, dunque, è quello di esaminare un modello di barriere multiple all'entrata [2] in cui esista una fondamentale simmetria nei comportamenti di incumbent ed entrante. Il paragrafo 2 presenta una breve esposizione dell'ormai famoso modello di Dixit (1980), in cui la capacità produttiva rappresenta la variabile strategica a disposizione del monopolista per impedire l'entrata di un concorrente, e delle critiche di Ware (1984) a questo schema teorico. Nel paragrafo 3 viene richiamato il modello con barriere multiple di Panunzi (1989), e sono evidenziati gli aspetti che lo rendono eccessivamente asimmetrico a vantaggio dell'impresa monopolista. Il paragrafo 4 contiene la riformulazione del modello di Panunzi alla luce delle considerazioni precedenti, con l'esposizione e il commento dei risultati. Alcune conclusioni sono ospitate nel paragrafo 5.

2. *La capacità produttiva come strumento di entry deterrence*

Uno dei più importanti modelli in cui la capacità viene utilizzata come variabile strategica per impedire l'ingresso di concorrenti nell'industria è quello di Dixit (1980), che appartiene alla categoria del *commitment models*, ovvero dei modelli in cui la minaccia verso i potenziali entranti si concretizza nell'intraprendere un'azione che, vincolando l'incumbent a causa della sua irreversibilità e del suo costo, risulta perciò più credibile. Più particolarmente, in esso l'impresa già operante (supposta sola sul mercato) può modificare a proprio vantaggio i risultati dell'equilibrio del mercato dopo l'entrata del concorrente con una scelta irrevocabile di investimento in capacità produttiva (*commitment*).

Dixit suppone la seguente funzione di costo per l'impresa monopolista (indicata con 1):

---

[2] Per barriere multiple qui si intende l'uso di più strumenti strategici che vanno ad agire sia sul lato dei costi sia su quello della domanda.

$$C_1 = \begin{cases} f_1 + r_1 k_1 + w_1 q_1 & \text{se } q_1 \leq k_1 \\ f_1 + (w_1 + r_1)\, q_1 & \text{se } q_1 > k_1 \end{cases}$$

in cui k_1 è la capacità produttiva e q_1 la produzione, mentre f_1 rappresenta il costo fisso di installazione, r_1 il costo per unità di capacità e w_1 il costo medio variabile. Poiché nel primo stadio, quello strategico, l'impresa 1 decide la capacità produttiva da installare, mentre nel secondo stadio viene effettuata la decisione sulla quantità da produrre, l'espressione relativa all'ipotesi $q_1 > k_1$ vale quando l'investimento in capacità effettuato nel primo periodo è inferiore rispetto all'output che si vuole immettere sul mercato, e risulta perciò necessario procurarsi la capacità addizionale all'inizio del secondo periodo per colmare il divario.

Al concorrente potenziale non viene data la possibilità di investire in capacità, per cui la sua funzione di costo è data da:

$$C_2 = f_2 + (w_2 + r_2)\, q_2$$

Riguardo ai ricavi delle imprese per ogni periodo, essi sono supposti crescenti e concavi rispetto alla propria produzione; inoltre i ricavi totali e marginali vengono ipotizzati decrescenti rispetto all'output dell'impresa rivale.

Sulla base di queste informazioni, vengono costruite le *best-reply functions*, che sono riportate nella Figura 1: la MM_1 è relativa al caso $q_1 > k_1$, la NN_1 si riferisce all'ipotesi $q_1 \leq k_1$ (entrambe riguardano il monopolista). La curva MM_2 è la funzione di risposta ottima per il concorrente.

Un equilibrio ordinario alla Cournot, a seconda della funzione di costo dell'incumbent, dovrebbe giacere su T o V. Ma la possibilità di scegliere k_1 dà al monopolista il vantaggio di manovrare nel proprio interesse il punto di equilibrio. È palese che se $k_1 \leq T$ l'equilibrio sarà in T, mentre se $k_1 \geq V$ si avrà equilibrio in V. Questo significa che $k_1 < q_T$ o $k_1 > q_V$ non sono scelte credibili; inoltre l'impresa già operante produrrà sempre un output corrispondente alla capacità installata nel primo stadio [3]. Dunque l'incumbent produce $q_1 = k_1$ sul segmento TV, e il rivale è uno Stackelberg follower.

Poiché π_2 decresce da T a V, se $\pi_2(T) < 0$ non vi sarà l'entrata dell'impresa 2 e il monopolista si porrà nel punto A, mentre se $\pi_2(V) > 0$

[3] Cfr. DIXIT (1980, pp. 99-100). Questa conclusione, come rileva lo stesso Dixit, è in contrasto con il risultato del modello di SPENCE (1977), in cui è adottata invece la strategia dell'eccesso di capacità, cioè si prevede la possibilità che nello stadio strategico possa essere installato un livello di capacità così elevato da non essere utilizzato.

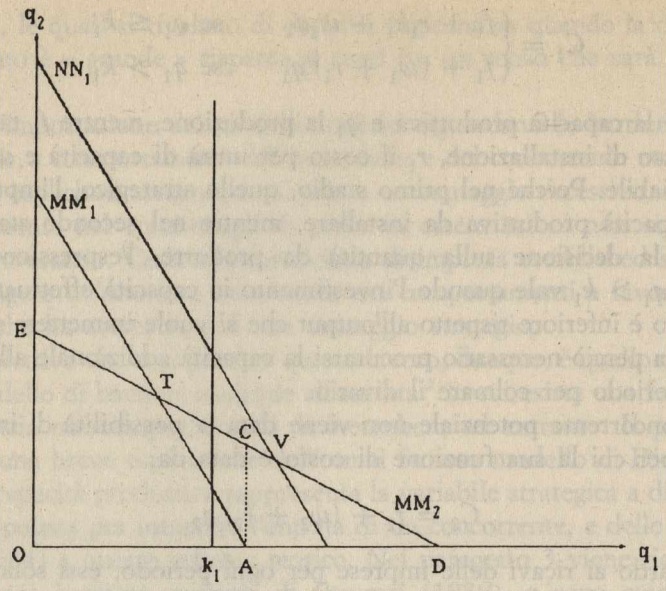

FIGURA 1

il concorrente entrerà certamente e quindi l'incumbent installerà k_1 in corrispondenza del punto su *TV* che gli garantisce il massimo profitto. Se $\pi_2(T) > 0 > \pi_2(V)$, ci sarà un punto *B* su *TV* tale che $\pi_2(B) = 0$. Dunque l'impresa già operante potrebbe scegliere un $k_1 > q_B$ per impedire al rivale di entrare nell'industria: se però $q_B < q_A$ egli sceglierà $k_1 = q_A$ e rimarrà solo sul mercato, mentre se $q_B > q_A$ potrà convenire un $k_1 = q_B$ solo se il profitto in tale punto risulterà maggiore di quello di un duopolio alla Stackelberg conseguente all'ingresso del concorrente.

In altri termini, se $\pi_2 = 0$ si verifica sul segmento *EC* l'entrata è bloccata, se $\pi_2 = 0$ è su *VD* l'entrata è certa, se $\pi_2 = 0$ è su *CV* occorre che l'incumbent confronti i profitti di monopolio con quelli di leader in un duopolio alla Stackelberg.

Una delle assunzioni cruciali del modello di Dixit è che l'investimento irreversibile in capacità viene concesso soltanto al monopolista, il quale poi gode anche del vantaggio di muovere per primo. Ware (1984) osserva perciò che un modello siffatto contiene un'eccessiva asimmetria a favore dell'impresa già operante: sembra dunque interessante esaminare anche il caso in cui all'entrante venga data la possibilità dell'investimento in capacità. La riformulazione del modello di Dixit effettuata da Ware si basa dunque su tre stadi: nel primo il monopolista investe in capacità; nel secondo il concorrente fa altrettanto dopo aver osservato la decisione del rivale; nel terzo

vi è competizione alla Cournot. In questo modo nello stadio finale entrambi i produttori incorrono soltanto nei costi variabili, a differenza del modello a due stadi, in cui l'entrante avrebbe dovuto affrontare contemporaneamente i costi di acquisizione della capacità produttiva (che hanno la natura di *sunk costs* in quanto vengono sostenuti prima che la produzione abbia luogo) e quelli variabili. Questa modifica riduce il vantaggio strategico dell'impresa già operante. La nuova situazione è sintetizzata nella Figura 2. MM_1 e NN_1 sono le best-reply functions dell'incumbent rispettivamente senza e

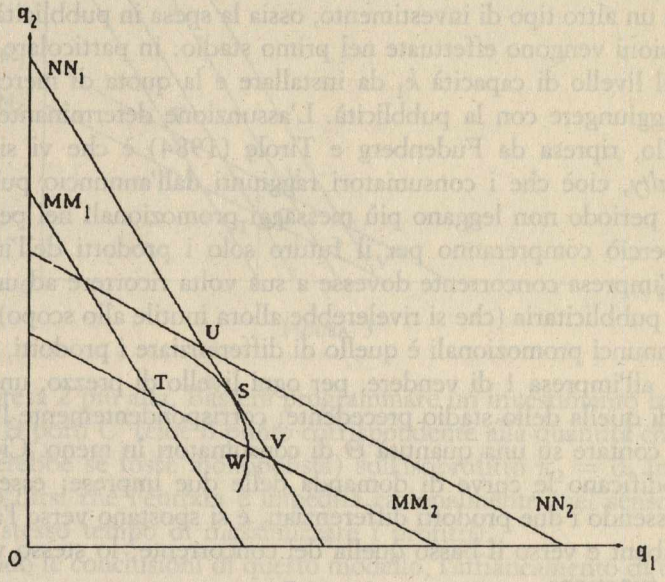

FIGURA 2

con l'installazione della capacità produttiva; analogo significato vale per MM_2 e NN_2, curve relative all'entrante. Se nel modello a due stadi l'incumbent volesse raggiungere il punto V, dovrebbe semplicemente porre $k_1 = q_V$. Ciò invece non è possibile nel modello a tre stadi, giacché la possibilità di replica consente al concorrente di scegliere la propria capacità in modo da spostare l'equilibrio su un punto a lui più favorevole (cioè su una curva di isoprofitto più bassa). Il miglior punto è quello di tangenza fra l'isoprofitto dell'impresa 2 e il segmento NN_1, ovvero S, la qual cosa forza l'incumbent a posizionarsi nel punto W. Ne consegue che V è ora irraggiungibile per l'impresa established, e il nuovo insieme dei possibili equilibri si riduce da TV a TW.

Per il resto, le varie situazioni relative alla possibilità di impedimento dell'entrata risultano analoghe all'analisi di Dixit [4].

3. *Il problema dell'asimmetria dei comportamenti*

In una struttura analitica che ripercorre quella del modello di Dixit (quindi basata su un equilibrio a due stadi), Panunzi ha costruito un modello con barriere multiple all'entrata, affiancando all'investimento in capacità produttiva un altro tipo di investimento, ossia la spesa in pubblicità. Entrambe le decisioni vengono effettuate nel primo stadio: in particolare, l'impresa 1 sceglie il livello di capacità k_1 da installare e la quota di mercato Θ che intende raggiungere con la pubblicità. L'assunzione determinante alla base del modello, ripresa da Fudenberg e Tirole (1984) è che vi sia l'effetto *brand loyalty*, cioè che i consumatori raggiunti dall'annuncio pubblicitario nel primo periodo non leggano più messaggi promozionali nel periodo successivo; perciò compreranno per il futuro solo i prodotti dell'incumbent, anche se l'impresa concorrente dovesse a sua volta ricorrere ad una propria campagna pubblicitaria (che si rivelerebbe allora inutile allo scopo) [5]. L'effetto degli annunci promozionali è quello di differenziare i prodotti, nonché di consentire all'impresa 1 di vendere, per ogni livello di prezzo, una quantità Θ in più di quella dello stadio precedente; corrispondentemente l'impresa 2 si trova a contare su una quantità Θ di consumatori in meno. Ciò significa che si modificano le curve di domanda delle due imprese: esse sono ora distinte, essendo i due prodotti differenziati, e si spostano verso l'alto quella dell'incumbent e verso il basso quella del concorrente; lo stesso vale per le best-reply functions.

Nella Figura 3 sono riportate proprio queste ultime: se Θ è la frazione di mercato raggiunta dalla pubblicità, è facile verificare che le curve di risposta ottima dell'impresa incumbent si sposteranno verso l'alto da MM_1 a MM'_1 e da NN_1 a NN'_1 per un valore pari a Θ, mentre la MM_2 relativa al concorrente si sposterà verso il basso (MM'_2) per un ammontare equivalente. Questa manovra porta il punto C verso destra in C' su una curva di isoprofit-

[4] In effetti, i due modelli sono molto simili; fra le eccezioni degne di nota vi è da evidenziare che Ware ricorre alla seguente funzione di costo: $C = f + \alpha q + (1 - \alpha)\, k$, in cui α rappresenta la proporzione dei costi totali costituiti dai costi variabili. Legata a questo tipo di funzione di costo è una delle conclusioni di Ware: man mano che α tende a 1, cioè man mano che i *sunk costs* tendono a svanire, il vantaggio strategico derivante dalla prima mossa si affievolisce per l'incumbent, fino ad arrivare ad un equilibrio simmetrico alla Cournot.

[5] Cfr. FUDENBERG e TIROLE (1984, pp. 361-362).

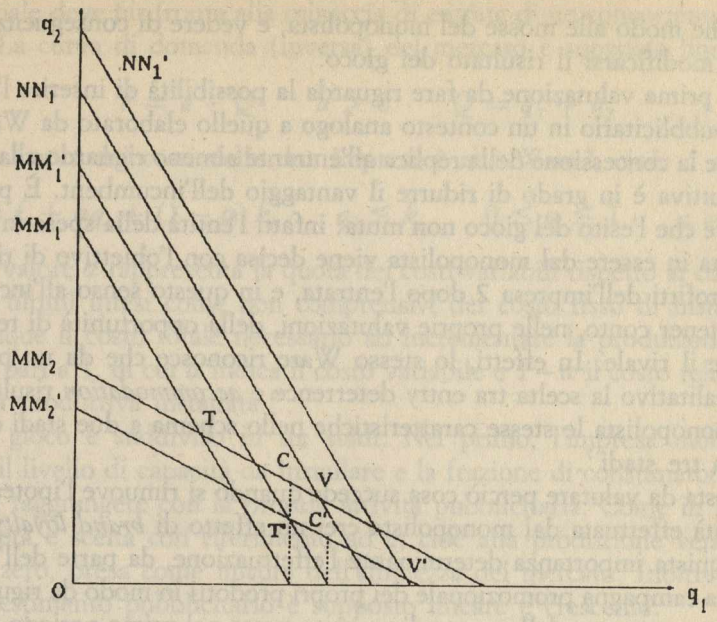

FIGURA 3

to dell'impresa 2 più alta. Basterà programmare un investimento in pubblicità tale che Θ porti C' (cioè il punto corrispondente alla quantità che l'incumbent venderebbe se fosse monopolista) sull'isoprofitto $\pi_2 = 0$; in tale evenienza può dirsi che l'entrata è impedita razionalmente (nel senso che consente allo stesso tempo di massimizzare i profitti).

Secondo le conclusioni di questo modello, l'affiancamento di un investimento in pubblicità ad un investimento in capacità produttiva non è necessario quando la dimensione del mercato è « piccola » rispetto ai costi di una singola impresa (vale a dire in mercati in cui sono presenti grandi imprese), mentre per mercati con dimensioni « grandi » rispetto ai costi la sua adozione si rivela un'efficace manovra di entry deterrence [6].

Riguardo al modello appena presentato, è lecito obiettare che ci si trova di fronte ad una situazione in cui le ipotesi di base relegano l'entrante in un ruolo puramente passivo, mentre il monopolista, potendo assumere l'impossibilità di reazione da parte del rivale, è in grado di manovrare gli strumenti a propria disposizione al fine di raggiungere il duplice obiettivo di massimizzazione del profitto e di eliminazione del concorrente. Potrebbe allora essere più realistico concedere all'entrante la possibilità di rispondere

[6] Cfr. PANUNZI (1989, pp. 867-868).

in qualche modo alle mosse del monopolista, e vedere di conseguenza come viene a modificarsi il risultato del gioco.

La prima valutazione da fare riguarda la possibilità di inserire l'investimento pubblicitario in un contesto analogo a quello elaborato da Ware, per vedere se la concessione della replica all'entrante almeno riguardo alla capacità produttiva è in grado di ridurre il vantaggio dell'incumbent. È possibile verificare che l'esito del gioco non muta: infatti l'entità della spesa in pubblicità posta in essere dal monopolista viene decisa con l'obiettivo di ridurre a zero i profitti dell'impresa 2 dopo l'entrata, e in questo senso all'incumbent basterà tener conto, nelle proprie valutazioni, della opportunità di replica di cui gode il rivale. In effetti, lo stesso Ware riconosce che da un punto di vista qualitativo la scelta tra entry deterrence e *accommodation* risulta avere per il monopolista le stesse caratteristiche nello schema a due stadi come in quello a tre stadi [7].

Resta da valutare perciò cosa succede quando si rimuove l'ipotesi che la pubblicità effettuata dal monopolista crei un effetto di *brand loyalty*. In tal caso acquista importanza determinante l'effettuazione, da parte dell'impresa 2, di una campagna promozionale dei propri prodotti in modo da riguadagnare almeno una parte della quota di mercato persa nel primo periodo a favore del rivale: è da sottolineare il maggiore realismo di questa congettura, dato che in mercati quali l'oligopolio differenziato oppure la concorrenza monopolistica (a cui Panunzi in un certo senso accosta la struttura di mercato che caratterizza il suo modello) l'attività di promozione delle vendite in generale risulta essere necessaria per il mantenimento (o anche l'ampliamento) della quota di mercato, perché necessaria è la differenziazione dei prodotti rispetto ai consumatori [8].

Se si concede, quindi, la possibilità di replica all'entrante per quel che attiene agli investimenti pubblicitari, ipotizzando altresì che i consumatori imparino a conoscere di conseguenza anche i suoi prodotti, è plausibile ritenere che ciò conduca ad una riduzione del vantaggio goduto dal monopolista. Il modello che segue si propone di valutare l'ammissibilità di questa congettura.

4. *Barriere multiple all'entrata: un gioco simmetrico*

Si consideri un mercato in cui è presente una sola impresa (indicata con

[7] Cfr. WARE (1984, p. 375).

[8] Sulle definizioni di oligopolio differenziato e di concorrenza monopolistica, cfr. SYLOS LABINI (1957, pp. 38-40), e LOMBARDINI (1992, p. 320).

1) la quale deve far fronte alla minaccia di entrata di un concorrente (impresa 2). La curva di domanda (inversa) del mercato è supposta lineare:

$$P = a - Q \qquad a > 0 \qquad Q = q_1 + q_2$$

La curva dei costi delle due imprese è alla Ware [9], cioè:

$$C_i = f_i + \alpha q_i + (1 - \alpha) k_i \qquad q_i \leq k_i \qquad 0 \leq \alpha \leq 1 \qquad i = 1, 2$$

Il valore α rappresenta la quota dei costi variabili rispetto ai costi totali (questi ultimi intesi come non comprensivi del costo fisso di installazione f_i): dunque il costo totale necessario ad incrementare la produzione di una unità è pari a 1, di cui α indica il costo variabile e $1 - \alpha$ il costo relativo alla capacità produttiva installata [10].

Il gioco è suddiviso in tre stadi. Nel primo, l'impresa monopolista decide il livello di capacità da installare e la frazione di consumatori Θ_1 che intende raggiungere con la propria attività pubblicitaria. Come in Panunzi, tale quota è scelta con riferimento ad a, cioè alla produzione vendibile al prezzo zero, presa come misura dell'ampiezza del mercato. Inoltre il costo dell'investimento pubblicitario è supposto lineare e crescente:

$$C_1^p = v\Theta_1 \qquad v > 0$$

In conseguenza dell'attività promozionale, i beni delle due imprese diventano differenziati agli occhi dei consumatori: ciò comporta che nel secondo stadio la curva di domanda del monopolista (che ora dovrà essere indicata con P_1) si sposterà verso l'alto di un valore Θ_1 (ad ogni livello di prezzo, la pubblicità gli consente di vendere Θ_1 beni in più rispetto al rivale), mentre quella del concorrente (P_2) si muoverà verso il basso per lo stesso valore.

Nel secondo stadio l'entrante, dopo aver osservato le decisioni di investimento dell'impresa incumbent, effettua le proprie. Per quel che concerne la pubblicità, egli si proporrà di raggiungere una frazione del mercato Θ_2, sostenendo un costo

$$C_2^p = v\Theta_2 \qquad v > 0$$

di modo che nello stadio successivo corrispondentemente la sua curva di

[9] Cfr. nota 4.

[10] Si è già rimarcato che l'eventuale adozione di una struttura di costi alla Dixit non altera il risultato finale dell'analisi se il monopolista sceglie un livello di spese pubblicitarie che porti a zero i profitti del concorrente. Sembra però coerente con l'impostazione del lavoro ridurre l'asimmetria a favore dell'impresa incumbent anche dal lato dei costi.

domanda si sposterà verso l'alto e quella del monopolista verso il basso.

Nel terzo stadio, infine, vi sarà competizione alla Cournot, cioè nelle quantità.

Ipotizzando, per semplicità,

$$\partial P_i/\partial q_i = \partial P_i/\partial q_j = 1 \quad \text{e} \quad f_i = f_j \qquad i = 1, 2 \qquad j \neq i$$

e assumendo un fattore di sconto pari a 1, i profitti delle due imprese saranno dati dalle seguenti espressioni:

$$\pi_1 = (a - \Theta_1 - 1 - v)\,\Theta_1 - f + (a + \Theta_1 - q_1^2 - \Theta_2)\,q_1^2 - \alpha q_1^2 - (1 - \alpha)\,k_1 + (a + \Theta_1 - \Theta_2 - q_1^3 - q_2)\,q_1^3 - \alpha q_1^3$$

$$\pi_2 = (a - \Theta_1 - q_1^2 - \Theta_2 - 1 - v)\,\Theta_2 - f + (a - \Theta_1 + \Theta_2 - q_1^3 - q_2)\,q_2 - - \alpha q_2 - (1 - \alpha)\,k_2$$

in cui q_1^2 e q_1^3 sono le quantità prodotte dall'impresa incumbent rispettivamente nel secondo e nel terzo stadio [11].

Il termine $(a - \Theta_1 - 1 - v)\,\Theta_1 - f$ in π_1 rappresenta i profitti del monopolista nel primo stadio, quando è ancora solo sul mercato; egli decide l'investimento pubblicitario, che consiste nel vendere una quantità Θ_1 con l'aiuto dei messaggi promozionali e con lo scopo di creare fedeltà nei consumatori verso i propri prodotti: il prezzo è dato da $a - \Theta_1$, il costo totale unitario di produzione è pari a 1 (la barriera inerente alla capacità produttiva diventa operativa nel secondo stadio, come del resto quella basata sulla pubblicità).

Il termine $(a - \Theta_1 - q_1^2 - \Theta_2 - 1 - v)\,\Theta_2 - f$ in π_2 indica i profitti dell'impresa 2 nel secondo stadio: la sua decisione di entrare deve essere accompagnata da una spesa pubblicitaria $v\Theta_2$ mirata a raggiungere i consumatori con una produzione pari a Θ_2: ora il prezzo è $a - \Theta_1 - q_1^2 - \Theta_2$, il costo totale unitario di produzione (per lo stesso motivo sopra esposto) è uguale a 1 [12].

La massimizzazione del profitto di ciascuna impresa conduce alle seguenti condizioni del primo ordine:

---

[11] L'espressione $(1 - \alpha)\,k_1$ in π_1 compare soltanto nel profitto del secondo stadio perché tale costo viene sostenuto dall'impresa incumbent al momento dell'installazione della capacità k_1.

[12] Si osservi che nel secondo stadio solo l'entrante può investire in pubblicità, mentre la perfetta simmetria dei comportamenti viene raggiunta nel terzo stadio. Ciò introduce nel modello un elemento di asimmetria a favore dell'impresa entrante. Devo questa riflessione all'anonimo referee del lavoro.

$$\partial\pi_1/\partial q_1^2 = a + \Theta_1 - \Theta_2 - \alpha - 2q_1^2 = 0$$

$$\partial\pi_1/\partial q_1^3 = a + \Theta_1 - \Theta_2 - \alpha - 2q_1^3 - q_2 = 0$$

$$\partial\pi_2/\partial q_2 = a - \Theta_1 + \Theta_2 - \alpha - q_1^3 - 2q_2 = 0$$

Si avrà di conseguenza che

$$q_1^2 = [a + \Theta_1 - \Theta_2 - \alpha]/2$$

mentre le funzioni di risposta ottima saranno:

$$NN_1 : q_1^3 = [a + \Theta_1 - \Theta_2 - \alpha - q_2]/2 \quad MM_1 : q_1^3 = [a + \Theta_1 - \Theta_2 - 1 - q_2]/2$$

$$NN_2 : q_2 = [a - \Theta_1 + \Theta_2 - \alpha - q_1^3]/2 \quad MM_2 : q_2 = [a - \Theta_1 + \Theta_2 - 1 - q_1^3]/2$$

Come è stato già notato, anche per le best-reply functions gli investimenti pubblicitari provocano uno spostamento verso l'alto della curva relativa all'impresa che li pone in essere, mentre abbassano quella dell'impresa rivale [13].

Facendo riferimento alla Figura 3, si è già osservato che il monopolista può impedire l'entrata in maniera razionale se riesce a muovere il punto C verso destra fino ad ottenere l'annullamento dei profitti dell'impresa 2.

Il punto C, appartenente alla MM_2, ha le seguenti coordinate:

$$q_1 = q_1^3 = [a + \Theta_1 - \Theta_2 - 1]/2 \qquad q_2 = [a - 3\Theta_1 + 3\Theta_2 - 1]/4$$

In esso, il profitto dell'entrante sarà dunque pari a:

$$\pi_2(C) = [\Theta_2(a - 3\Theta_1 - \Theta_2 - 2 + \alpha - 2v)]/2 + \\ + [(a - 3\Theta_1 + 3\Theta_2 - 1)^2]/16 - f$$

Poiché, si è detto, l'obiettivo dell'impresa incumbent è quello di effettuare un livello di spesa pubblicitaria tale da non rendere conveniente l'ingresso sul mercato dell'impresa 2 e da consentirgli di produrre la quantità di monopolio, bisogna individuare il valore di Θ_1 per i quali $\pi_2(C) \leq 0$.

Risolvendo la disequazione, si ottiene:

$$\Theta_1 \geq \left\{a + 7\Theta_2 - 1 - 2\sqrt{[2\Theta_2(6\Theta_2 + 1 - \alpha + 2v) + 4f]}\right\}/3$$

e

[13] Le curve *MM* differiscono dalle curve *NN* per il fatto che nelle prime si ha $\alpha = 1$, cioè in esse tutti i costi sono variabili.

$$\Theta_1 \leq \{a + 7\Theta_2 - 1 + 2\sqrt{[2\Theta_2(6\Theta_2 + 1 - \alpha + 2v) + 4f]}\}/3$$

Come era prevedibile, l'investimento pubblicitario dell'impresa 1 viene a dipendere da quello dell'entrante, il quale tra l'altro decide nel periodo successivo dopo aver osservato le scelte del monopolista. Ciò significa che l'introduzione della simmetria nel comportamento dei due operatori quanto meno riduce le possibilità per l'impresa incumbent di individuare una manovra di spesa pubblicitaria « sicura » ai fini della entry deterrence.

Si noti altresì che, nel caso in cui $\Theta_1 = \Theta_2 = 0$, si ottiene che $\pi_2(C) \leq 0$ per $a \leq 1 + 4\sqrt{f}$. Viene dunque confermato che l'impiego del solo strumento della capacità produttiva (operante dal lato dei costi) impedisce l'entrata in maniera razionale solo se la dimensione del mercato è « piccola » rispetto ai costi [14].

Tornando all'ipotesi di spese pubblicitarie positive, il monopolista, dovendo perseguire in C il duplice obiettivo di impedire l'entrata del concorrente e di massimizzare il profitto da monopolista, dovrà scegliere Θ_1 anche con lo scopo di rendere più grande possibile il proprio profitto in C. Esso è uguale a:

$$\pi_1(C) = (a - \Theta_1 - 1 - v)\,\Theta_1 + [(a + \Theta_1 - \Theta_2 - \alpha)\,(a + \Theta_1 - \Theta_2 + \alpha - 2)]/4 + \\ + [(a + \Theta_1 - \Theta_2 - 1)\,(a + 5\Theta_1 - 5\Theta_2 + 3 - 4\alpha)]/8 - f$$

da cui

$$\partial\pi_1(C)/\partial\Theta_1 = (9a - \Theta_1 - 7\Theta_2 - 7 - 2\alpha - 4v)/4$$

Dunque la spesa in pubblicità che consente all'impresa incumbent l'ottenimento del massimo profitto è:

$$\Theta_1 = 9a - 7\Theta_2 - 7 - 2\alpha - 4v$$

Riassumendo, affinché la entry deterrence sia razionale, dovranno valere contemporaneamente le due condizioni seguenti:

$$\Theta_1 \geq \{a + 7\Theta_2 - 1 - 2\sqrt{[2\Theta_2(6\Theta_2 + 1 - \alpha + 2v) + 4f]}\}/3 \qquad [1]$$

e

$$\Theta_1 \leq 9a - 7\Theta_2 - 7 - 2\alpha - 4v \qquad [2]$$

[14] Cfr. PANUNZI (1989, p. 867).

Ciò significa che dovrà essere:

$$\{a + 7\Theta_2 - 1 - 2\sqrt{[2\Theta_2(6\Theta_2 + 1 - \alpha + 2v) + 4f]}\}/3 \leq$$
$$\leq \Theta_1 \leq 9a - 7\Theta_2 - 7 - 2\alpha - 4v$$

per cui si può scrivere:

$$\{a + 7\Theta_2 - 1 - 2\sqrt{[2\Theta_2(6\Theta_2 + 1 - \alpha + 2v) + 4f]}\}/3 \leq$$
$$\leq 9a - 7\Theta_2 - 7 - 2\alpha - 4v \qquad [3]$$

Da quanto innanzi consegue che

$$a \geq 10/13 + 3\alpha/13 + 6v/13 +$$
$$+ \{14\Theta_2 - \sqrt{[2\Theta_2(6\Theta_2 + 1 - \alpha + 2v) + 4f]}\}/13 \qquad [4]$$

Il risultato è simile a quello riportato da Panunzi: la pubblicità possiede un'efficacia maggiore come strumento di entry deterrence quando la dimensione del mercato è « ampia » rispetto ai costi. Tuttavia tale ampiezza non è ora un dato univoco e determinato, bensì risente delle scelte del concorrente potenziale riguardo a Θ_2.

Calcolando

$$\partial a/\partial\Theta_2 = \{14\sqrt{[2\Theta_2(6\Theta_2 + 1 - \alpha + 2v) + 4f]} - 2(6\Theta_2 + v) -$$
$$- (1 - \alpha)\}/13\sqrt{[2\Theta_2(6\Theta_2 + 1 - \alpha + 2v) + 4f]}$$

è facile verificare che per valori di v tali che

$$v \leq 14\sqrt{f} + (1 - \alpha)/2$$

quella derivata sarà certamente positiva, e in questo caso la dimensione minima che dovrà caratterizzare il mercato, affinché l'uso di investimenti pubblicitari da parte del monopolista sia efficace per impedire l'entrata di concorrenti, sarà sempre maggiore al crescere dell'entità della spesa che a sua volta l'entrante deciderà di realizzare.

Il risultato appena esposto ha un significato ben preciso. Esso conferma che la minaccia costituita dalla capacità produttiva installata funziona bene soprattutto in mercati in cui vi sono poche imprese di grandi dimensioni (e perciò caratterizzate da costi unitari elevati in rapporto all'ampiezza del

mercato), mentre la spesa in pubblicità può rivelarsi utile in mercati grandi rispetto alla dimensione delle imprese [15]. Ma allo stesso tempo smentisce che con la pubblicità sia sicuramente possibile ridurre il numero dei concorrenti nell'industria.

Si è già detto che Panunzi avvicina la situazione che caratterizza il proprio modello ad un contesto di concorrenza monopolistica, pur ammettendo notevoli differenze [16]. È probabilmente più corretto parlare di oligopolio differenziato: infatti, considerando soprattutto l'analisi svolta in questa sede, esistono interdipendenze oligopolistiche dovute al fatto che le scelte di un'impresa riguardanti la pubblicità si riflettono nella funzione del profitto dell'impresa rivale, la quale perciò da esse non può prescindere.

Più precisamente, il modello di Panunzi può ricollegarsi a un oligopolio differenziato di breve periodo: in questo caso, infatti, è plausibile pensare che un'impresa, avendo in precedenza realizzato attività promozionali, si sia assicurata la fedeltà dei consumatori, e abbia così creato un proprio mercato speciale ben distinto da quello dei concorrenti, caratterizzato dalla decrescenza del prezzo in relazione alla quantità venduta. Da esso è dunque possibile escludere i rivali sulla base di opportune scelte inerenti alla differenziazione del prodotto, che conducono tra l'altro al conseguimento di extraprofitti.

Il modello qui presentato, invece, richiama una situazione di oligopolio differenziato di lungo periodo (in senso marshalliano). Ammettere infatti che anche l'entrante possa a sua volta ricorrere ad attività di promozione delle vendite significa dare a quest'ultimo la possibilità di sostenere le spese di vendita « di impianto », che sono assimilabili a costi fissi [17] e come tali, perciò, sostenibili solo nel lungo periodo (sempre a patto che $a > 1 + 4\sqrt{f}$, ovvero che la dimensione del mercato sia tale da non rendere razionale da parte dell'impresa incumbent l'utilizzo esclusivo della strategia dell'investimento in capacità produttiva come strumento per scoraggiare l'entrata).

Si può allora supporre che il concorrente potenziale sia attirato dai profitti realizzati dal monopolista, e, al fine di entrare su quel mercato [18], ponga in essere attività promozionali a un livello tale da rendere positivi i propri profitti post-entrata. Questa manovra sarà possibile perché la crescita

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[15] Cfr. Panunzi (1989, p. 869).

[16] Cfr. Panunzi (1989, p. 858).

[17] Cfr. Sylos Labini (1957, p. 88).

[18] Si è osservato che in presenza di differenziazione dei prodotti il concetto di « industria » viene a perdere il proprio significato: cfr. Sylos Labini (1957, p. 39).

di Θ_2 alzerà il livello critico di riferimento di a (al di sopra del quale l'entrata di nuovi concorrenti è razionalmente impedita a favore del monopolista), e così l'impresa incumbent dovrà dividere il mercato con il rivale.

Si è già visto che Θ_2 abbassa la curva di domanda dell'impresa già operante, per cui essa venderà, a parità di prezzo, una quantità minore di prodotto.

Sembrerebbe pertanto che un modello con barriere multiple all'entrata caratterizzato da investimenti strategici simmetrici quasi non conceda alcun tipo di vantaggio all'impresa established. È possibile invece riscontrare un *first-move advantage* a favore di quest'ultima. Infatti la condizione [4] riguardante la dimensione minima del mercato affinché le due politiche di entry deterrence siano razionali può essere riscritta al fine di esplicitare Θ_2. Si avrà quindi:

$$\sqrt{[2\Theta_2(6\Theta_2 + 1 - \alpha + 2v) + 4f]} \geq 10 + 3\alpha - 13a + 6v + 14\Theta_2$$

da cui

$$184\Theta_2^2 - 2(182a - 139 - 43\alpha - 82v)\Theta_2 + (100 + 9\alpha^2 + 169a^2 + 36v^2 + 60\alpha - 260a + 120v - 78a\alpha + 36\alpha v - 156av - 4f) \leq 0$$

Ne consegue che il monopolista potrà rimanere solo sul mercato se

$$\Theta_2 \leq \{(182a - 139 - 43a - 82v) + \sqrt{[2028(a-1)^2 - 1144v(a-1) + 4(1-\alpha)(325a - 107v) + 100v^2 + 193\alpha^2 + 914\alpha - 1107 + 736f]}\}/184 \quad [5]$$

il che equivale a dire che il concorrente, per poter entrare nell'industria e godere di profitti di lungo periodo positivi [19], dovrà effettuare una spesa in pubblicità tale da raggiungere un numero di consumatori superiore a quel valore.

Si può dimostrare che tale investimento richiesto all'entrante (legato alla struttura della domanda e dei costi) è notevolmente maggiore di quello effettuato dall'impresa incumbent nel periodo precedente [20]. In altri termini,

[19] Per profitti di lungo periodo qui si intende il totale dei profitti relativi ai tre stadi del gioco.

[20] Infatti si avrà $\Theta_1 > \Theta_2$ solo quando

$$f < [-61(a-1)^2 + 28v(a-1) - 2(1-\alpha)(25a - 21 - 4\alpha - 8v)]/32, \quad [6]$$

in cui il valore al secondo membro sarà maggiore di zero per

$$v > [61(a-1)^2 + 2(1-\alpha)(25a - 21 - 4\alpha)]/[28(a-1) + 16(1-\alpha)],$$

giacché l'espressione [5] è conoscibile per il monopolista, egli può prenderla come riferimento per determinare Θ_1 al fine di massimizzare il profitto secondo la formula [2], sicuro altresì che tale Θ_1 sarà sensibilmente minore di quel Θ_2 che concede al rivale l'opportunità di entrare sul mercato [21].

Il risultato esposto appare di notevole importanza perché si ricollega a concetti ben noti nell'ambito dell'economia dei mercati. Spesso infatti un'impresa consolida la propria posizione monopolistica grazie a politiche di promozione delle vendite, le quali rafforzano gli ostacoli all'entrata (in alcuni casi esse si rivelano addirittura determinanti). Ponendo in essere campagne pubblicitarie a sostegno dei propri prodotti, l'impresa incumbent costringe un potenziale concorrente a preventivare investimenti massicci in attività promozionali per attirare presso di sé un numero di consumatori tale da consentire la creazione di un proprio mercato [22]. Poiché però (in questo

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e quindi, a parità di v, sarà tanto più negativo quanto maggiore sarà la dimensione del mercato (indicata da a).

[21] A conferma di ciò, si osservi lo schema che segue (in cui f^* è il valore calcolato usando l'espressione [6] riportata nella nota precedente):

				$\alpha = 0$				$\alpha = 1$			
	a	v	f	Θ_2	Θ_1	Θ_2/Θ_1	f^*	Θ_2	Θ_1	Θ_2/Θ_1	f^*
1)	5	1	2	4.75	0.73	6.50	−33	4.44	0.90	4.96	−27
2)	10	2	4	10.41	2.16	4.81	−151.97	10.09	2.34	4.32	−138.66
3)	15	3	6	16.06	3.59	4.47	−357.50	15.75	3.76	4.18	−336.88
4)	20	4	8	21.71	5.01	4.33	−649.59	21.40	5.19	4.12	−621.66

Si può ancora rilevare che, a parità degli altri valori, il rapporto Θ_2/Θ_1 cresce al crescere dei costi e diminuisce al crescere della dimensione del mercato. Infatti, con riferimento alla situazione sub 1), si ha che:

				$\alpha = 0$				$\alpha = 1$			
	a	v	f	Θ_2	Θ_1	Θ_2/Θ_1	f^*	Θ_2	Θ_1	Θ_2/Θ_1	f^*
1a)	10	1	2	10.91	2.62	4.16	−160.34	10.60	2.80	3.79	−146.53
1b)	5	2	2	4.24	0.35	12.08	−29	3.93	0.51	7.73	−23.50
1c)	5	1	3	4.76	0.66	7.26	−33	4.46	0.81	5.47	−27

[22] Cfr. LOMBARDINI (1992, p. 368).

modello come nella realtà) la pubblicità ha effetti graduali e comunque ritardati sui consumatori, la produzione raggiungerà il proprio livello ottimale dopo un certo tempo, con profitti negativi nei periodi iniziali, cioè quelli caratterizzati dalle spese pubblicitarie. Dunque più intense saranno le campagne pubblicitarie effettuate dall'impresa incumbent, maggiori saranno le perdite iniziali del potenziale concorrente, e con minore probabilità i profitti successivi riusciranno a sopravanzare tali perdite. In definitiva, l'entrata può essere scoraggiata se l'impresa già operante può spendere in pubblicità una quota notevole purché ciò non conduca anche i suoi profitti a zero [23].

L'efficacia delle spese promozionali mirata a scoraggiare l'entrata risiede allora nel fatto che una nuova impresa è costretta a sostenere investimenti pubblicitari di considerevole entità, i quali richiedono un volume di vendite elevato fin dall'inizio. In questo senso, allora, può anche dirsi che una barriera all'entrata consiste nell'estensione del mercato [24].

5. *Considerazioni conclusive*

L'utilizzo di barriere operanti dal lato sia dei costi sia della domanda vede ridotta la sua efficacia – come era prevedibile – quando viene data all'entrante la possibilità di replica. Nell'analisi esposta, questo risultato si verifica in particolare grazie alla rimozione dell'asimmetria riguardo alle spese pubblicitarie. Tuttavia l'impresa incumbent mantiene ancora un vantaggio, dovuto al fatto che essa investe per prima in attività di promozione delle vendite. Ciò comporta infatti che l'investimento pubblicitario del concorrente utile per entrare nel mercato dovrà essere un multiplo (maggiore di uno) della spesa sostenuta dal monopolista nello stadio precedente, e conferma così che in industrie caratterizzate da elevate spese promozionali queste ultime finiscono per costituire una barriera all'entrata spesso più efficace di quelle legate ad altri tipi di investimento.

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[23] Cfr. WATERSON (1984, p. 135).

[24] Cfr. SYLOS LABINI (1957, p. 90). Questo risultato è già indirettamente emerso in considerazioni precedenti sul modello esaminato: cfr. nota 21.

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MULTIPLE BARRIERS TO ENTRY IN A SYMMETRIC FRAMEWORK

This paper considers a duopolistic model with multiple barriers to entry (capacity and advertising) in which the potential entrant can reply to the investments made by the incumbent. The main result obtained is to show that the symmetry in the strategic set of the two firms reduces the advantage of the incumbent. Moreover it is shown that advertising is not always an efficient instrument of entry-deterrence, in particular when the market dimension is large relative to the firms' efficient scale.

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AN EMPIRICAL NOTE ON UNION INFLUENCE OF WORKERS' COMPENSATION PAYMENTS

by
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I. *Introduction*

The absolute decline in union membership in the United States has been well documented. Two studies (Neumann and Rissman, 1984; Allen, 1988) attribute this decline to the role of government as a substitute for unions in bargaining and arbitration when all other options have been exhausted. American courts often provide a legal outlet for workers to articulate grievances about workplace safety. Even with this decline, however, unions appear to have retained much of their former power and members still enjoy substantial wage premiums over their nonunion counterparts in certain labor activities (Reid and Faith, 1987; Fairris, 1992; Ashraf, 1992). There is evidence that unions' power in providing added safety for union members at construction sites (Weil, 1992) is substantial, and unions also influence the outcomes of various political issues (Kau and Rubin, 1981). In fact, the role of unions fits nicely into a general framework on congressional voting developed by Peltzman (1984). Further developing Peltzman's hypothesis, Endersby and Munger (1992) provide evidence that both blue-collar and professional/specialist unions provide campaign funds to Democratic candidates to a significantly greater degree than to Republican candidates. Therefore, the Democratic Party has historically self-selected as the workers' party, where unions have historically used PAC contribu-

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tions to obtain favorable legislation (Chappell, 1981, 1982; Masters and Zardkoohi, 1988).

We attempt to show that, although absolute membership is declining, union members still enjoy significant power in many workplaces. Union members are often more successful (politically powerful) in securing workers' compensation payments relative to their nonunion counterparts in the labor market. Section II explains the growing power of unions despite declining membership. Section III contains the methodology and data used; and Section IV presents the empirical results. Section V closes with concluding comments.

II. *The Political Power of Unions in the Workplace: A "Crowding Out" Theory*

Neumann and Rissman (1984) contend that government often plays a substitute role for the union grievance mechanism by allowing nonunion employees a legal outlet to gain labor reforms. However, based on a seminal model by Peltzman (1984), researchers have pointed out the substantial political action contributions that union representatives have made to the Democratic Party in the United States. The Democrats have dominated the U.S. House of Representatives and the U.S. Senate for over a decade, and have historically been identified as the "workers' party" in the United States. Masters and Zardkoohi (1988) provide many examples and case studies where Peltzman's model of congressional behavior neatly explains the advantages that union members have obtained through favorable legislation.

The present study supports these views, that based upon Peltzman's model, union members tend to "crowd out" their nonunion counterparts in the use of the governmental alternative as a grievance mechanism. Not only do union members have an internal advantage at the workplace, their support from Democrats allows unions to control the governmental alternative as well (we call this "crowding out"). A number of factors tend to make such a possibility tenable. First, union members have historically obtained favor from the dominant political party. Second, as tight-knit organizations, unions are more likely to represent the proponent-group in the Stigler-Peltzman model of obtaining regulatory (as opposed to congressional) support. Third, union members are more likely to understand their legal rights. These explanations are based upon the concepts of transactions costs – the costs of obtaining information and bargaining within the political process is lower for union members.

Weil (1992) provides evidence of the extraordinary power of union influence on regulators by examining the role of unions in the enforcement of OSHA standards in the construction industry. Given OSHA's limited power, many have criticized the agency's ability to enforce safety standards at many work sites (Weil, 1992). Weil notes that unionized workers are more likely to exercise their rights under OSHA, and the agency typically enforces its standards at unionized workplaces more stringently, particularly in the construction industry. Union members receive formal training concerning health and safety risks, and they initiate and participate in OSHA inspections. Unionized workers have also successfully bargained for protection against reprisals from employers for initiating OSHA inspections (Weil, 1992). Using OLS, Weil points out that unions play a positive role in increasing the duration of an OSHA inspection and increasing the penalties per violation at heavily unionized work sites. Also, the probability of OSHA inspections in unionized establishments (for 1985) is shown to be greater than in comparable nonunion establishments; the inspection probability advantage that unions exert grows larger as the size of the establishments being compared is larger.

Weil points out that a "two-tiered" system of regulation has emerged, where unions represent a real force in ensuring safety and health, while for nonunion workers, OSHA has become a "toothless tiger". Weil's findings certainly conform to and support the view that union members typically "crowd-out" nonunion workers within the regulatory process.

III. *Union Power and Workers' Compensation Programs*

Slightly different from the OSHA regulations mentioned above, workers' compensation laws are state laws. States often use various litigious systems to provide compensation to injured workers, but because of its litigious nature, certainty of payment is often eroded (Worrall and Appel, 1985). Litigious systems and state laws are both subject to state legislators, regulators, and judges. The nature of the state system provides an outlet to both union and nonunion employees to express their grievances; but, given transactions costs considerations, union members have an opportunity to "crowd-out" their nonunion counterparts. Based on this theory, we propose the following relationship:

(1) WCPLF = f (UNEMP, UNION, MED, HOUSE, SENATE, GOV, COLF, MALF);

The dependent variable in equation (1) is a measure of the workers' compensation payments per labor force member for each state, in a model using pooled estimates (macro-data) for 1982-1986. The independent variables include UNEMP, which measures the unemployment rate for each state. UNEMP is expected to be positively related to WCPLF to capture a larger number of individuals unemployed due to workplace injuries. The variable UNION is the percent of the state's labor force that is unionized and is expected to be positively related to the power to secure workers' compensation benefits based upon the crowding out view supported in this study. The variable MED measures average daily hospital costs per state and captures the varying costs of workplace injuries across states; MED is expected to show a positive relationship with WCPLF. The political variables include HOUSE, SENATE, and GOV. HOUSE and SENATE are measures of the percent of the state's House of Representatives and the state's Senate made up by Democrats, and GOV is a dummy variable equal to one if the state's governor is a Democrat, or zero otherwise. All of the political coefficients are expected to be positive based on the view that Democratic officials self-select as the workers' party and also favor union workers who support them with PAC contributions. The variable COLF measures the percent of a state's labor force made up by construction workers. COLF is expected to be positive, in order to reflect higher injury rates. Finally, MALF measures the percent of each state's labor force employed in manufacturing. The expected sign of MALF is ambiguous here. The success of OSHA in targeting manufacturing would imply a negative sign; however, the relative danger of manufacturing as opposed to the service industry may imply a positive coefficient.

IV. *Empirical Findings*

The model described above employs OLS for 49 states (Nebraska is excluded based upon the existence of a unicameral state legislature) for five consecutive years in the mid-1980s. This forms a rather large data set, where the independent variables are allowed to vary. This allows for political status across states, and political status within states to change over time. Table 1 below reports a summary of the statistics used in our analysis, while the regression results are reported below in Table 2. The important variable, UNION, retains a positive sign when regressed on WCPLF and is highly significant in the model as well. However, there are a number of other important factors in explaining the securement of workers' compensation

TABLE 1

STATISTICAL SUMMARY

Variable	Mean	Std. Dev.	Min.	Max.
WCPLF	$155.64	0.081	$46.64	$503.90
UNEMP	8.00%	2.463	2.80%	18.00%
UNION	19.32%	7.350	5.80%	35.80%
MED	$189.75	42.740	$97.00	$372.00
HOUSE	58.9%	18.80	14.3%	97.7%
SENATE	60.7%	19.28	17.2%	100.0%
GOV	0.648	0.478	0	1
COLF	3.95%	1.33	0.55%	9.24%
MALF	15.23%	6.339	3.05%	28.71%

payments across states and time. Among the political variables, SENATE is highly significant while all three (SENATE, HOUSE, GOV) retain their expected positive signs in the analysis. This points out that Democratic politicians, at the state level, appear to self-select as the labor party, as well as ease the litigious process in favor of unionization across states. The variables UNEMP and MED are both positive as expected, and are highly significant as well. The variable MED captures medical costs differences across states, while the measure for state unemployment proxies the number of workers on injury-leave across states. The measure of the degree of the construction industry across states is an important (statistically significant) determinant of the number of workers requiring workers' compensation due to high injury rates. We also report a negative and significant sign on the variable MALF.

In all, our findings add some support to the view that unions do "crowd-out" nonunion employees in the securement of workers' compensation benefits. Although the descriptive nature of our data is limited in relation to which individuals are actually receiving these monetary benefits, it does provide a probability relationship that points out that those states that are heavily unionized have more successful claimants within the process than less unionized states. Given this probability relationship, it follows that the union members are indeed securing these payments.

V. *Concluding Comments*

This study presents support of the role of unions in using the political

TABLE 2

SUMMARY OF OLS RESULTS
DEPENDENT VARIABLE: WCPLF

Independent Variables	Variable Definition	Coefficients
UNEMP	Unemployment Rate Across States	0.0061 * (3.33)
UNION	Degree of Unionization Across States	0.0019 * (2.36)
MED	Avg. Daily Hospital Cost Across States	0.0010 * (8.11)
HOUSE	% of State House Made up by Democrats	0.0017 (0.04)
SENATE	% of State Senate Made up by Democrats	0.0882 * (2.22)
GOV	0,1 Dummy Variable for Republican, Democratic Governor (respectively) Across States	0.0096 (1.16)
COLF	% of State's Labor Force in Construction Industry	1.0126 * (3.08)
MALF	% of State's Labor Force in Manufacturing Industry	−0.2847 * (−4.31)
Observations = 245 R-square = 0.5030 F-value = 29.9 * Adj. R-square = 0.4862 Durbin-Watson = 1.964		

The values in parentheses above represent *t*-values for the regressors.
Significance Levels: * = coefficient significant at the .05 level or higher.
NOTE: The intercept has a coefficient value of −0.1824, and is significant at the .01 level based on a *t*-value of −5.23.

process in order to secure a higher success rate in obtaining workers' compensation benefits. Evidence from previous research points out that in the face of declining absolute union membership, unions still maintain advantages over their nonunion counterparts in using the political process. As Weil (1992) points out, unionized construction workers are successful in having OSHA regulations stringently enforced. This paper presents evidence that once workplace injuries do occur, unionized workers are more successful in securing often elusive workers' compensation benefits. This evidence has further implications that may aid in explaining the rising cost

of workers' compensation insurance across industries that involve union workers, and hence lead to higher production costs and output prices.

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NOTA EMPIRICA SULL'INFLUENZA DEI SINDACATI SUGLI INDENNIZZI AI LAVORATORI

Peltzman (1984), Kau e Rubin (1981), Endersby e Munger (1992), e Chappell (1981, 1982) sostengono che i sindacati esercitano ancora una grandissima influenza politica a tutti i livelli di governo nonostante la diminuzione delle loro iscrizioni (Allen, 1988; Neumann e Rissman, 1984).

Questo articolo segue la logica sviluppata recentemente da Weil (1992) che dimostra che i sindacati esercitano una forte influenza sull'applicazione degli standard OSHA nell'industria delle costruzioni. Mentre Weil esamina l'influenza dei sindacati nella prevenzione degli incidenti sul lavoro, questo articolo analizza il loro ruolo e potere politico nell'assicurare i compensi a seguito di incidenti in vari stati americani e tempi. L'evidenza indica che gli iscritti ai sindacati hanno un vantaggio significativo rispetto ai loro colleghi non iscritti per quanto riguarda gli indennizzi. I risultati di questo studio confermano le conclusioni di Weil e rivelano che nella fase successiva ad un incidente si ha uno spiazzamento per quanto riguarda la protezione dei lavoratori contro i rischi dei lavori pericolosi.

RECENSIONI E LIBRI RICEVUTI
(Book-reviews and Books Received)

CANTARELLI Davide, *Lezioni di economia politica*. 2ª ed., Padova, Cedam, 1992, pp. XXII-775. L. 86.000

Vivendo ormai da molti anni nella città dei libri e degli studenti dico impeccabile nel suo servizio – non solo pedagogico e scientifico, ma anche culturale e civilizzatore – un manuale che consenta, come libro chiave, di ottenere quanto accadde a Cardano – proponiamo questo salto di fantasia analogica – secondo la sua *Autobiografia*: « Chi fu quel che quando avevo già, se non sbaglio, vent'anni, mi vendette un Apuleio latino e subito si allontanò? Fatto sta che io, che fino allora non ero stato a scuola se non una sola volta, non conoscevo affatto il latino e avevo comprato quel libro unicamente per la legatura dorata, il giorno dopo mi ritrovai a sapere il latino come ora, e quasi contemporaneamente il greco, lo spagnolo e il francese, almeno quel tanto che basta a capire i libri scientifici, pur ignorando la lingua parlata e la grammatica ».

Ecco, questo consente il manuale di Cantarelli alla cui 1ª ed. abbiamo dedicato recensione in questa stessa « Rivista » (N. 4, 1986, pp. 394-95). È un manuale che – sempre mémore delle radici e della sistematica di Demaria inserita nel grande corso della letteratura mondiale – introduce ogni specificazione dell'economia politica e micro e macro, sia teorica sia pratica, giacché si pone come interprete del mondo sensibile dei rapporti economici e non soltanto del loro mondo di carta – e questo ben oltre il pudore con cui l'Autore nella « Prefazione alla seconda edizione » (pp. XXI-XXII) presenta l'irrobustimento e il perfezionamento della sua pluriennale fatica conoscitiva la cui « filosofia sociale » – come la chiama – ha bene inteso nella sua autenticità di spiegazione scientifica le variazioni economiche causate dalla realtà politica generale mondialmente esplosa nel 1989.

Fatta salva la recensione della 1ª ed. – che riteniamo indenne da ogni turbamento critico sostanziale se non per insoddisfazione di svolgimenti chiarificatori e sviste sofferte in sede di correzione di bozze – vediamo le modifiche della 2ª ed. da noi attentamente ripercorsa con estrema vigilanza sulla ricchezza delle fonti dottrinarie che, nominalisticamente, più sotto ricordiamo quale pregio indiscutibile di questa 2ª ed. del cui testo (ch'è sostanzialmente quello della 1ª ed.) a suo tempo s'è dunque già detto, mentre qui ne confermiamo la « musica » manualistica.

Rispetto alla 1ª ed., la Lezione I (*ex* I) – sulla realtà economica e sua scienza – resta immutata confermando i fondamenti della Scuola di Demaria e corroborando il discorso critico attraverso Castellino, Samuelson, Stigler. La Lezione II (*ex* II-III) – sulla logica economica – vede e tratta aspetti e problemi metodologici, con sintesi chiarificatrice rispetto alla 1ª ed., insistendo sulla Scuola teorica di Demaria e su Hayek mentre sono dialetticamente accolti Blaug, Hicks, Machlup, Samuelson, Zamagni. La Lezione III (*ex* IV) – sull'analisi matematica

ed econometrica – ha una riscrittura più « palatabile » della precedente ed. valendosi del conforto di R.G.D. Allen, Demaria, Ferguson, Frisch, Koutsoyannis, Kmenta, Marshall, Nichol, Zamagni. Le Lezioni IV-IX (*ex* V-X) – rispettivamente: sui « dati di partenza », su prodotto e fattori di produzione, sul costo, sulla funzione di produzione, sull'ottimo produttivo, sulla teoria dell'utilità – sono Lezioni che pazientemente (come richiede ogni milizia d'analisi!), appoggiandosi a Demaria Di Nardi Bagiotti, ripercorrono – specialmente attraverso Gossen Jevons Menger Walras Marshall Pantaleoni Schumpeter Frisch Schneider J. Robinson Hicks Samuelson Stigler Wicksell ma anche Lombardini Marcato Toniolli Carlson Dorfman Ferguson Koopmans Henderson Quandt Williamson Hirschmann Lipsey Marris fino a Zamagni – ripercorrono la letteratura scientifica secondo temi polarizzatori e canonici della tradizione economicistica i quali, in questa 2ª ed., hanno aggiunte soppressioni riscritture di poco conto rispetto alla 1ª ed. La Lezione X (*ex* XI) – su curve di indifferenza e preferenze rivelate – è tipicamente equilibrista facendo perno su Pareto ma con il polittico sia di antecedenti sia di successori quali Edgeworth Fischer Frisch Bowley Neumann Morgenstern onde – coi nostri Demaria Di Nardi Zamagni – l'avveduta aggiunta, rispetto alla 1ª ed., di una breve trattazione della teoria delle preferenze rivelate. La Lezione XI (*ex* XII) – sulla domanda del consumatore – ricorda il « modo » di Demaria Di Nardi Bagiotti criticamente proposto a fronte di Galbraith Hicks Leibenstein Samuelson Koutsoyannis Lipsey e soprattutto Slutsky con aggiunta, rispetto alla 1ª ed., dell'esposizione del metodo di Slutsky per determinare gli effetti di reddito e sostituzione. Le Lezioni XII-XV (*ex* XIII-XVI) – rispettivamente: sulla teoria dello scambio, su concorrenza e monopolio, sui regimi di mercato intermedi – si muovono secondo sequenza logica (non dunque cronologica!) attraverso Edgeworth Jevons Walras Pareto Marshall Chamberlin Cournot Stackelberg Arrow Debreu Hahn Hurwicz Leontief Patinkin J. Robinson Fellner Sraffa Sweezy Hayek Bresciani-Turroni Einaudi Baumol Neumann Morgenstern Asimakopulos Lachmann Koutsoyannis e, naturalmente, i nostri Demaria Di Nardi Zamagni. In questo gruppo spicca la Lezione XV (*ex* XVI), sui regimi intermedi di mercato, che ha subito riduzioni modifiche aggiunte rispetto alla 1ª ed.: la trattazione del duopolio di Cournot è stata sostituita, perché ritenuta imprecisa, con una nuova, che si rifà direttamente all'esposizione originaria di Cournot stesso; sempre in tema di oligopolio, Cantarelli ha introdotto una pur breve trattazione della teoria dei giochi. La Lezione XVI (*ex* XVII) – sulla teoria dell'impresa e connessi problemi teorici e pratici – si appoggia su Andrews Bain Baumol Machlup Marris Koutsoyannis Earley Furlan Goisis Gordon Hall Hitch Lester Stigler Williamson Jacquemin Sylos Labini Modigliani. Le Lezioni XVII-XXI (*ex* XVIII-XX e XXIII) – rispettivamente: sul funzionamento del sistema economico, su moneta banca credito, sull'evoluzione storico teorica dell'analisi macroeconomica, sull'equilibrio macroeconomico, sull'inflazione e stagflazione – non hanno sostanziali mutamenti rispetto alla 1ª ed. appoggiandosi a R.G.D. Allen Baumol Bresciani-Turroni Ackley Fisher Keynes Klein Lange Malthus Marshall Marx Pigou Ricardo Robbins Say Schackle Schumpeter Sylos Labini Wicksell Dornbusch Fischer Davidson Smolensky Duesenberry Friedman Hansen Hicks Metzler Patinkin Bathia Tobin Hines Meade Phillips Perry Pitchford Kaldor Samuelson Schultze e ai nostri Demaria Baranzini Marangoni Cao Pinna Castellino Lenti Arcelli Bresciani-Turroni Pace Dell'Amore Onado Graziani Jossa Modigliani Martino Tarantelli. La Lezione XXII (*ex* XXI) – sull'equilibrio macroeconomico nelle sue più recenti formulazioni – contiene un excursus che va da Patinkin ai Nuovi economisti neoclassici ai Nuovi keynesiani: Chrystal Fischer Friedman Gray Leijonhufvud Lucas Phelps Shaw Sargent Taylor e i nostri Arcelli Bellone Casarosa Jossa Moro Vercelli. Questa Lezione XXII ha l'aggiunta netta più significativa rispetto alla 1ª ed.: le aspettative razionali, argomento inserito con pienezza e centratura nel panorama della più recente letteratura macroeconomica straniera e italiana. La Lezione XXIII (*ex* XXIV) – sui rapporti economici internazionali da Ricardo a

Heckscher Ohlin Samuelson Leontief e scuole canoniche: classica, neoclassica, keynesiana – è ridata nella già raggiunta esemplarità della 1ª ed. Qui gli economisti sono: W.R. Allen Brooman Coulbois Dornbusch Fischer Haberler Johnson Kindleberger Marshall Meade Metzler Mundell Rubczynski Schneider Swann Viner e i nostri Basevi Bresciani-Turroni D'Alauro Gandolfo Graziani Manfredini Moro Zaneletti. La Lezione XXIV (*ex* XXII) – su crescita e sviluppo economico – dai classici a Marx e Schumpeter fino ai post keynesiani e neoclassici moderni e, quindi, Harrod Domar Solow, con Demaria Cozzi Baumol Dixit Johansen Kaldor Mirrlees Kindleberger Kurz Pasinetti Phelps Robinson Samuelson Swann Sylos Labini Wan e, altresì, Graziani Josa Lunghini Nardozzi Valli – è una Lezione ch'è stata avvedutamente ridotta così da rendere più saporito il « piatto » da passare in un manuale: quasi fosse il richiamo « aureo » di Apuleio in ogni sua propagazione « cardanica »!

A questo punto – giusta conclusione visto l'attacco di questa recensione – ricordo *Il Buongoverno* di Einaudi: « L'insegnante deve insegnare a ragionare, a vedere dentro ai fatti economici la parvenza esterna e la realtà vera; deve far vedere come nove su dieci dei ragionamenti economici correnti nei giornali, nei discorsi familiari, nei comizi, nei parlamenti sono dei sofismi; deve addestrare la mente a scoprire la verità tra mezzo ai molti errori. Formare la mente ed anche il carattere del giovane: ecco lo scopo della scuola ». E allora a Cantarelli il plauso con l'auspicio di aggiungere, non oltre ogni lustro, un ramo all'albero della conoscenza manualistica come da lui intesa, ch'è pure il nostro intendimento, giacché chi professa un insegnamento, se è sempre un ascendente dei propri nipoti, è anche una fonte di fiumi e ruscelli che da lui sgorgano verso l'avvenire.

ACHILLE AGNATI

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